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United States Naval Institute Proceedings

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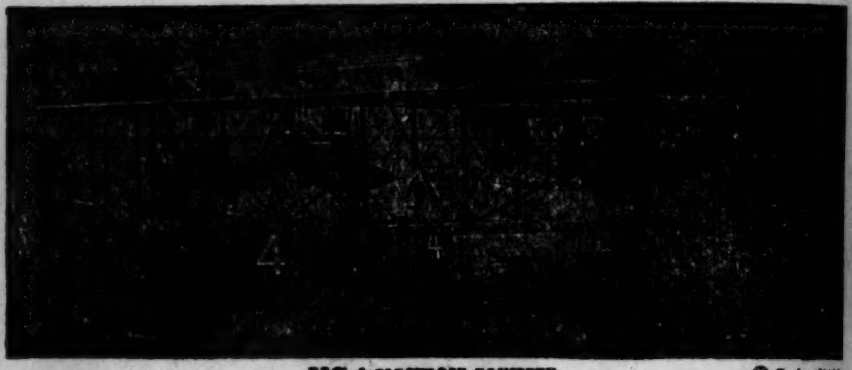

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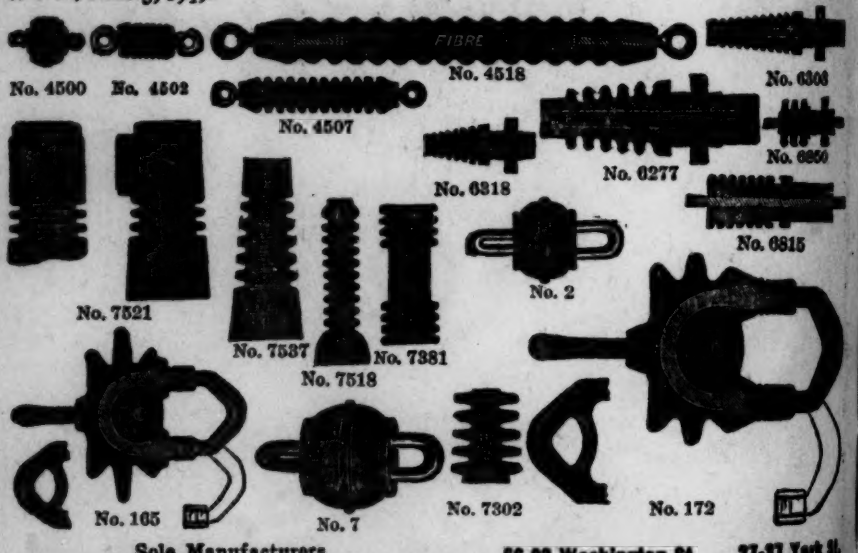

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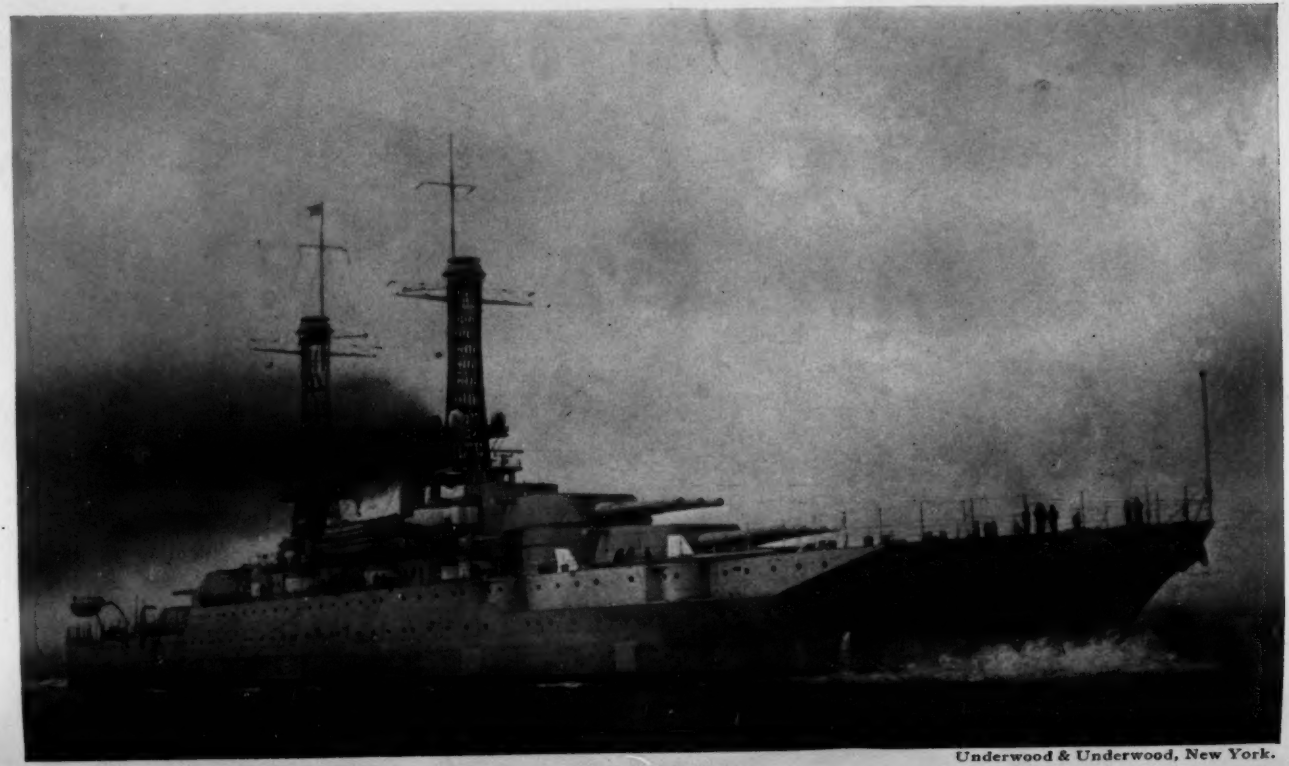

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UNITED STATES
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Vol. 46, No. 6 JUNE, 1920 Whole No. 208

AMERICAN SUBMARINE OPERATIONS IN THE WAR

By Carroll Storrs Alden, Ph. D.,
Professor of English, U. S. Naval Academy

Although there has never been a time among warring peoples when they have not known the advantage of a surprise attack, no other fighting craft has been governed so absolutely by the principle as the submarine. Knowledge of the presence of this vessel gives a foe opportunity, commonly to elude, and often to destroy it. On the other hand, if for a few moments it can choose its position unobserved, it may speedily destroy transport, cruiser, or battleship. It was because of this necessity of secrecy that the British gave out such inadequate reports during the war. The public was told nothing of the force of submarines that the Allies had assembled, or of their zone of operations. Whereas the Admiralty published fairly definite reports of the loss of the *Cressy* and the *Queen Mary*, and of the achievements of the *Lion* and the *Broke*, they permitted scarcely a mention of any of the 50 or 60 submarines lost by England, or of the several hundred enemy vessels which Allied submarines destroyed. Again, while we heard much in regard to American destroyers operating from Queenstown and Brest, and American transports plying to England and France, our newspapers published hardly a word about the American Fifth Submarine Division that operated from Bantry Bay, Ireland, the Fourth Division based on the Azores, and other divisions that patrolled the American coast, including Panama.

The spell of secrecy for the submarine, though no longer imposed, is not easily thrown off.

This we may especially wonder at in the case of England, for there is no more brilliant chapter in the history of the Royal Navy

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than that of their submarine service during the War.[1] In proportion to the numbers employed, their losses were heavy, but their successes defy comparison. Let us mention a few of the latter.

In the Baltic, Commander Max Horton in 1915 torpedoed the 13,000-ton battleship *Pommern,* also two destroyers and two transports; Lieutenant Cromie sank the cruiser *Undine* of 2650 tons; further, these officers and others sank so many steamers laden with ore from Sweden that they created a panic in shipping circles in Hamburg. In the Dardanelles and Sea of Marmora, 1914 and 1915, Lieutenant Norman Holbrook sank the battleship *Messudiyeh;* Lieutenant Courtney Boyle sank gunboats, a minelayer, and transports; Commander M. E. Nasmith sank so many supply ships that the Turks attributed the activities of his boat, the only one operating in the area, to 11 English submarines—which after all was but a slight error, for his boat happened to be the *E-11;* later Nasmith sank the battleship *Haireddin Barbarossa,* and that too when she was escorted by a destroyer; Lieutenant D'Oyly Hughes varied the exploits by swimming ashore from the *E-11* and blowing up the viaduct of the Ismid Railway; while Commander Nasmith ended the year 1915 in the Sea of Marmora by a record cruise of 48 days, during which he sank 46 enemy ships, including the destroyer *Var Hissar* and 10 steamers. Nor would even a casual reference to British submarine operations be complete without mention of the less spectacular but even more important activities in the North Sea; Commander Max Horton sank the German light cruiser *Hela* and later a destroyer; Commander C. P. Talbot and Lieutenant Commander C. P. Shove each got a destroyer; and Commander Lawrence during the latter part of 1916 torpedoed two of the latest dreadnoughts, *Grosser Kurfurst* and *Kronprinz,* and, though failing to sink them, made them useless for months following; the British submarines destroyed altogether 20 of the German U-boats, and as a still more valuable service, they maintained a scouting patrol at all strategic points along the German coast, where as they were constantly in radio communication with the British Admiralty and Grand Fleet they greatly minimized the chances for the German High Seas Fleet, cruisers, or individual raiders to slip out and make a surprise

[1] For a full account see Newbolt's *Submarine and Anti-submarine,* New York, 1919.

attack. One of the pleasing features of the British successes was the provision their submarines so commonly made for the saving of the crews of German and Turkish supply ships.

In comparison with these operations of the silent British, those of the boastful and vainglorious Germans, directed chiefly against British and neutral shipping, seem mean and paltry. Nor would we compare our own operations with them. For not only was the Royal Navy vastly superior in the number and type of its boats, but its submarine craft had for three years been reveling in opportunities such as no longer existed when America entered the conflict. But what history should not fail to record is that American submarines, in spite of great handicaps, joined the fray with a glorious ardor, like that of the American destroyers, and soon had a deterrent influence on enemy operations.

PART I. THE PROBLEM AND PREPARATIONS FOR MEETING IT

In 1917 Germany was staking all on her submarine campaign. She had eliminated Serbia and Montenegro; she had overrun most of Roumania and was exploiting whatever wealth remained; she had occupied Poland and a large area of Russia, and was soon to follow this with a treaty, the most humiliating ever forced upon a European country; further she had well-laid plans for crushing Italy. This would leave only France and England among her major enemies. If England, the strongest in resources and fully determined (just as 100 years before in the Napoleonic wars), could be separated from the rest of the world by the undersea boats, and reduced to impotence in one to three months as the naval experts of Germany promised, she could be indifferent as to the later actions of America and all other nations.

Fortunately for civilization, England was not starved out in one month or three; but hard pressed she showed signs of sharp distress. In combating the U-boats she used every known weapon; nets, mines, depth charges, all kinds of armed surface craft, and submarines. America, eager to co-operate, in the very first month after joining the Allies sent a flotilla of destroyers. Two months later she sent a squadron of converted yachts. Then arose the question, should she send her submarines? England was using so many of hers in conjunction with the Grand Fleet and in patrolling the North Sea, that she had not enough to patrol the

ship lanes leading from the west to southern Ireland and England. She suggested our entrance into this phase of operations. Should America take the risk?

The risk was undeniably great, not only on account of the character of the service, but because our submarines were relatively unprepared. For years the Government, though carrying through a moderate building program, had been throwing the chief emphasis on battleships and destroyers. Thus when it was proposed to send our submarines across, there were strong objections raised.

These objections were based on the inferiority of our older boats. We had under construction and nearing completion a strong force of O-boats and R-boats, modern and superior in type; but if America was to send a division with least delay, she must employ those already in commission, many of them the older boats. These had been freely criticized with respect to engines and periscopes. The engines had given trouble because of unreliability, breaking down in heavy weather and at other times as well. Further, they annoyed the crews by excessive smoking and the failure of mufflers and muffler valves, with inadequate provision for ventilation. Their best speed was three or four knots less than that often made by the Huns. The periscopes had lenses with relatively poor optical qualities, of low power only. Besides this, they were non-housing, because of which a boat running at periscope depth in heavy seas was likely to expose the top of the bridge and even the conning tower. The joints of the tube were not entirely tight, with the result that there was frequent annoyance due to leaking and the fogging of the lenses.

Germany had made thorough naval preparations of a general character previous to 1914, and from 1914 to 1917 she had concentrated on submarines. To place ours against theirs seemed at first glance like entering in an athletic contest as the American representative one who was near-sighted and somewhat inferior in speed and endurance, when the rivals had also the great advantage of experience gained from previous contests. Nevertheless, after all had been considered, Captain T. C. Hart, U. S. N., an officer with experience in submarines, was called from transport duty to take over the command of Division Four and Five. As he related afterwards, while he was still debating the

wisdom of sending a division across, he suggested "Europe" to four young commanding officers, asking if they could make the voyage. The emphatic reply they instantly gave in the affirmative, and the eagerness they showed in explaining away all difficulties, naturally helped him to reach a decision. About mid-summer, 1917, the Department determined to send Division Five to England.

The Government had been pushing work on the submarines already laid down, which were about the same in number as those in commission. Further, it was soon stripping Honolulu and the West coast, and sending their craft through the Panama Canal. All the submarine bases became centers of activity, Honolulu and San Pedro, on the Pacific, and Panama and New London, on the Atlantic coast. There was the overhauling of all the boats, and many of the older types were again put into commission. And, finally, there was the training of the personnel. In this New London led. Where three small buildings previously had answered all purposes for base work and school, there suddenly sprang up a power house and machine shop, electrical laboratory, torpedo and gun laboratory, magazines, and barracks for officers and enlisted men numbering up to 800.

It was during this period of preparation that there occurred the loss of the U. S. S. *F-1*. It was on the 17th of December, 1917, when she was on her way to Panama, nine miles northwest of Point Loma, California, that the accident occurred. Out of the thick fog, at seven in the evening, came the U. S. S. *F-3* and with a suddenness that made futile the efforts of officers on the bridge of both boats, the *F-3* rammed her sister ship just forward of the main hatch. The impact opened up a big hole in the hull of the *F-1* and she went down in 40 seconds. The shock threw the engineer of the *F-3* down between his engines and knocked the radio operator off his stool, but fortunately their boat sustained only slight damages. Even before her safety had been made certain, the *F-3* stood by and succeeded in rescuing the four of the *F-1* that had been on the bridge, the other nineteen of her complement having gone down with the vessel. The calmness and good discipline of the crew of the *F-3* was illustrated by the radio operator, who before picking himself up reached to his key and sounded that to assure himself that his instrument was ready to respond to orders.

The promptness with which work began after the declaration of war is indicated by the history of the U. S. S. *L-2*. On 13 April, 1917, they received orders to mobilize. At once they began drills of all kinds. On the 21st they painted the outside of their vessel standard light gray. They kept up the drills, and for the benefit of officers engaged in harbor defense they ran through an experimental seine, a part of which they carried away without being impeded in any way. On the 5th of May they proceeded to the Philadelphia Navy Yard for overhauling. This was long and thorough with the effecting of various alterations suggested by the British. On the 12th of November it was completed. Then after a month of testing and drills, on 4 December, 1917, the *L-2* started with the rest of the Fifth Division for Ireland, by way of the Azores.

The number of qualified submarine men was small in comparison with the sudden demand. An idea of the practice required for the making of a crew out of raw material is suggested from the following adapted from the War Diary of the U. S. S. *E-2*:

25 March, 1918, Navy Yard.—Crew mustered at quarters and ship placed in commission. Taking on stores preparatory to sailing.

26 March.—Taking on stores, and going over machinery and apparatus.

27 March.—At 3.00 p. m. got under way for New London, Conn., in company with S. P. *Owera*. Ran well for two hours, when main clutches gave way off Execution Rocks. Took tow line from *Owera*.

29-31 March, Submarine Base, New London, Conn.—Working on clutches and machinery.

1 April.—Made first submerged run in the river; down two hours. (Crew green and inexperienced; prospects of good material, but hard work needed to develop it.)

3 April.—Cruised 43 miles, Long Island Sound.

5 April.—Under way at 4.00 p. m. for tactical exercises. In column, *M-1, D-2, D-3, E-2*, and *G-2* stood out to Block Island Sound. On signal, went ships right 90° and executed crash dive. First one under; stayed down one-half hour. Came to surface and proceeded to Gardiner's Bay. Anchored in cove at 8.30 p. m., and charged batteries at intervals all night. Cruised 27 miles.

6 April.—At 4.45 a. m., up anchor. Returned to Base. Flotilla commander held inspection. Cruised 27 miles.

7-11 April.—Overhauling machinery and preparing engine for trial trip.

12 April.—Got under way at 1.15 p. m. for Long Island Sound. Made partial running dive; down one half hour. At 4.35 p. m. met Division and took place in column: *L-5, E-2, D-1, D-2, D-3, G-2*. Passed through Race,

sea rough, and on signal made crash dive; first one under; stayed down one-half hour. (Nearly all the crew were sea sick, and the chief gunner's mate, who was the diving rudder man, was the worst; as the prospects for the crash dive were not encouraging, the Commanding Officer took the diving rudder himself. At 70 feet we got away from the roll, and the crew pulled together a little, only to lose themselves again when we came to the surface. This shows how necessary it is to have a seasoned crew for such work.) After coming to surface, steamed to rendezvous three miles off Montauk Point. Anchored for an hour; then got under way at 9.00 p. m. to pass through patrol line and make practice attack on vessel in Fort Pond Bay. Nearly ran on Cerebus Shoal. Got through patrol lines, and at midnight attacked tank steamer. Started back for Base. Cruised 48 miles.

13 April.—Returning to Base from midnight in driving snow storm. Arrived at Base, 4.10 a. m. Cruised 21 miles.

15 April.—At 10.43 a. m. left Base for full power engine run. Went out to sea and ran for New York. Had a submarine patrol with us to keep vessels from mistaking our identity. Engines ran splendidly. Ran to midnight, covering 151 miles.

16 April.—Still running full power. About 1.00 a. m. nearly ran down two-masted sailing vessel which was carrying no lights. (Her skipper swore loudly through megaphone.) Rounded Ambrose Light Ship at 1.30 a. m. and stood back for New London. When we were off Montauk Point, an airplane circled over us and came so near that we exchanged greetings. Also sighted dirigible on patrol. Arrived at Base at 4.00 p. m. Power trial successful. Total distance, 321 miles; average speed, 12.88 knots per hour.

19 April, Block Island Sound.—Called all hands at 6.00 a. m. for emergency drill. Cleared dock in six minutes. Dived in pond, lying on bottom in 45 feet. Then blew tanks, and started out of pond on engines. When outside, executed crash dive. Came to surface and steamed for New London. At 4.00 p. m. joined Division coming out of New London for maneuvers. Stood out through Race on port beam of *Fulton*, and made crash dive. Came up and steamed for Watch Hill Point. Lay in wait for *Fulton*. When she was sighted, made quick dive and approached her to attack. *Fulton* was zig-zagging, causing us some difficulty in getting in good position for a shot. Came to surface and returned to Great Salt Pond. Anchored there about 7.30 p. m. Got under way at 9.00 p. m. to attack *Fulton*, which was then anchored about four miles off coast. Could not see *Fulton* as she showed no lights, but guessed her position by seeing lights of submarine chasers. Dived and started on attack. Ran with periscope above water till we sighted patrol boats; then dived under them and stayed down. After running about four miles, made porpoise to look for *Fulton*. Saw her about 300 yards dead astern. We had passed directly under her. Making a sharp turn we simulated firing. The attack was successful. Came to surface, and started ahead on engines for Long Island Sound. On the way the gyro compass went wrong, and as no one had discovered the fact we found ourselves out at sea, having

fortunately passed by some bad shoals. At midnight, still under way, having made five submerged runs; under for four hours, covering 20 miles. Cruised on surface this day 61 miles.

20 April.—At midnight still under way. Anchored at 2.00 a. m. off Montauk Point, and charged batteries till 7.00 a. m. Then got under way to circumnavigate Block Island without being seen by chasers. Sighted six chasers and made crash dive, staying down two hours. Then came quickly to surface, and hooking on both engines returned to New London, arriving there at 3.00 p. m. (Crew pretty well exhausted.)

26 April.—Stood out with maneuvering division at 6.20 p. m. Got signal to make crash dive just as we reached the Race and had a tow crossing ahead. Nearly dark and tide running strong. Got below surface in 50 seconds, and to 60 feet in one minute and 35 seconds. As we slowed the motors, the tide suddenly started us down. Tried to hold her by speeding up motors, but hit bottom at 100 feet. Blew tanks and came up. Found tide had set us very near to Gull Rocks. *Fulton* came along and nearly ran us down, as we had just come up and showed no lights.

1 May.—At 8.58 a. m. proceeded up the Bay to Test Barge. Submerged and fired Whitehead torpedo to try out tube mechanisms. Fired two Mark VII, Mod. 4, B. L. torpedoes and one Type O torpedo. Found that deflection of torpedoes was caused by above water tubes of barge, as submerged firing gave perfect runs.

3 May, Newport, R. I.—Took aboard allowance of Mark VII, Mod. 4, torpedoes with war heads and torpedo equipment. At 1.35 p. m. proceeded across Bay to Bailey's Point and carried out experiment with mine apparatus. At 3.27 p. m. exchanged calls with U. S. S. *Hannibal*.

It is interesting to note on reading the complete War Diary of the *E-2* how her crew had grown in efficiency. This was shown not only in their keeping at sea for long or short runs regardless of the weather, but also in their coming to know their engines and making them run with a regularity earlier believed impossible. Also it is to be noted how much more rapid had become the operations of the crew, as indicated by their reducing the time for a quick dive[1] by nearly one-half.

At 8.30 p. m. on the 16th of May, after nearly two months of this intensive training, the *E-2* received the welcome orders "to proceed to sea for war service." Two hours and a half later she was under way with the *L-5* attended by the U. S. S. *Owera*. Four torpedoes had been made ready and loaded into tubes, for orders directed that she should "sink any submarines encountered."

[1] *Quick dive* bids fair entirely to supplant the earlier and less appropriate term *crash dive*.

1

2. 3.

The "E-2" Making a Quick Dive.

PART II. OPERATIONS OF THE AMERICAN SUBMARINE PATROL

I. ON THE AMERICAN COAST

The visits of the *Deutschland* and the *U-53* while we were yet writhing in our neutrality were undoubtedly intended to give America a warning not to show too much concern over German piracy in European waters. Like most of the Boche threats this served to instruct rather than to terrify. No sooner had the Administration realized that war was inevitable than it took measures for the protection of Boston, New York and Long Island Sound, Philadelphia, Chesapeake Bay, and Panama.

For the defense of the Canal, preparations on the part of both Army and Navy had been unusually complete, and there seemed little danger. However, as this was a strategic point towards which much shipping converged, it was deemed prudent to keep some of the older submarines patrolling there. Compared with operations in the Irish Sea where there was the stimulation of frequent contact with the enemy, the service off Colon was deadly dull. The nearest a German submarine is supposed to have approached was the Virgin Islands, landing at Porto Rico to obtain fresh provisions. And even this was but a rumor, never officially confirmed.

Two weeks before the German submarines appeared off the North Atlantic coast early in the summer of 1918, the Navy Department had received a warning from the British Naval Intelligence Department. What experiences our submarines had as they went out to meet the peril may be seen from the various war diaries.

From the War Diary of the U.S.S.N-2[3]

21 July, 1918, at Provincetown, Mass.—[Lieutenant H. C. Frazer, U. S. N., commanding.] Received telegraph orders from district commander relative to the enemy submarine which sank three barges off Chatham. Accompanied by S. C. *263*, put to sea at 11.30 a. m.

22 July.—Lying in awash condition. At 3.00 a. m. under way on half switch, course 90° true. At 5.20 a. m. made a crash dive and began periscope patrol on half switch. Depth 17 feet. Came to awash condition, then submerged. S. C. *251* cruised astern of us at a distance of one and a half to two miles. Whenever we came to the surface, she came alongside and gave whatever information she had picked up by radio watch. At

[3] To meet the needs of this article, the writer has not hesitated in quoting the war diaries to condense, and to make slight changes in diction for the sake of clearness.

7.24 p. m. came to surface, awash condition. At 8.30 p. m. began charging batteries, air banks, and the four torpedoes in tubes.

From the War Diary of the U. S. S. N-3

23 July, 1918.—[Lieutenant A. G. Dibrell, U. S. N., commanding.] At 2.55 a. m., the sea being smooth, the moon full, and the weather hazy, sighted a steamer on our starboard beam in moon's rays 800 yards distant. A moment later sighted another vessel on our port quarter headed straight for us. Thinking that the latter, which was indistinct in the mist, might be a submarine cruiser attacking the steamer we prepared to attack her. The vessel astern, however, was soon recognized to be a transport. I fired Very's pistol, giving preliminary recognition signal, a green cartridge, and then picked up the flash light to make the recognition signal "D. D." The preliminary recognition signal was answered on the transport by one long and three short blasts on the whistle. As I made the "D. D.", I heard the order given from the bridge of the transport, "Fire." I yelled, "Don't fire, this is an American submarine." But as I yelled, the gun was fired and the shell hit the *N-3* at frame No. 79 just at the water line. The transport was not more than 50 yards away, and we could see a great many men on deck and hear them talking. Then I heard the order given to load. By this time five or six had gathered on our bridge, and we shouted, "Don't fire." "Don't shoot. This is the *N-3*." All the time we were making the recognition signal with the blinker light. When the shot was fired, other ships began scattering, and we expected to be fired on by each in turn.

At this time, 3.10 a. m., the chief gunner's mate reported that water was coming into the torpedo compartment rather fast; at which I gave orders to blow as much oil aft as the after tanks would hold and all then remaining in the forward fuel tanks overboard, at the same time to blow forward trimming, adjusting, and auxiliary overboard, and flood the after trim.

A destroyer then came in sight on our starboard quarter 200 yards distant. I made the preliminary recognition signal, and started to signal that we had been hit and request him to stand by. But as soon as he saw our green rocket, he went hard left and headed straight for us. We went full speed astern to prevent his ramming us. He continued to turn towards us, although our flag held between two men was plainly exhibited over the marker buoy with a flash light on it. At the same time we were making the recognition signal and yelling that we were an American submarine. When the destroyer was 20 yards off, I heard the officer on the bridge give hard right and he grazed our bow, which was pointed hard left. Smoke and flame were pouring from his stacks. Fortunately, however, we had been recognized by the destroyer, which proved to be the U. S. S. *Preble*, Lieutenant Mack in command. He now stood by and sent Lieutenant Evans over in a boat to see if we needed assistance. This we declined when we succeeded in stopping our leaks by caulking.

We picked up an unexploded British 7.5-inch shell in our forward superstructure [fired by the British transport]. As we examined our injuries, we found 17 rivets sheered at the water line, frame No. 79 bent and twisted, hole in the superstructure, anchor lost, forward diving rudder bent and knuckle joint sheered, and torpedo expulsion tank dented. Torpedo compartment was flooded to the height of the combing between the forward battery compartment and torpedo compartment.

There were no casualties. The electricians are particularly to be commended for standing unflinchingly by their motors and giving prompt response to orders.

We were probably not seen until we gave recognition signals. Are recognition signals worth the paper they are written on?

Lieutenant Dibrell's experience was by no means an isolated one, for since one of the successful ways of attacking the wily Fritz was to shell him or ram at sight, every submarine, according to orders, was to be regarded as hostile until proved otherwise. Consequently, friendly craft constituted the greatest danger to our submarines and likewise to the British.

As the *N-3* came limping back to New London, bow rudders out to avoid sinking, she was met by the *N-5*, going out to relieve her on patrol. It happened to be the *N-5's* first patrol, and her commanding officer, as he admitted later, seeing what were the experiences he was about to face, felt his heart grow heavy.

The *N-5* had her area of operations well south of Block Island including the lanes of the incoming and outgoing ships of New York. A considerable part of the day she spent on submerged patrol, but if no vessel was near, at set times she would come to the surface, raise her radio masts, and listen in for orders from Arlington or Siasconset or other stations—each would repeat them as it opened up at its appointed hour. In this way she would get information where the German submarines were operating, and plot their positions when word came of their sinking ships.

While on patrol she kept strictly to her designated area, with instructions to leave it only on contact with the enemy. But during the latter half of August she operated with a schooner laden with stores and serving as a floating base; they had a roving commission, cruising all the way from George's Bank, Newfoundland, to Cape May. The United States never employed any mystery ships on the Atlantic coast, but they did purchase and commission three schooners, manned by officers and sailors in uniform, which they sent out attended by submarines. It was hoped that the schooners would enable certain of the submarines to keep to sea much longer,

and incidentally if Germans interested in sinking fishing boats and merchantmen should attack the schooners our own submarines might seize the opportunity to make contact. It was on the return of the *N-5* from a week's hard but uneventful patrol that orders came for her to put to sea two days later with the schooner, or floating base, *Charles E. Whittemore.* The commanding officer and several of the crew were sick with "flu," all were tired out. Nevertheless, there was no hanging back.

It was originally planned for the *N-6* as well as the *N-5* to accompany the *Whittemore.* One was to be towed for two days, while the other cruised about at will. The schooner carried provisions and oil enough for a month. But on their way to Block Island, the steering gear of the *N-6* jammed, throwing her across the bows of the *N-5,* who rammed her. Thus the *N-6,* having her port forward hydroplane carried away and a hole stove in her forward torpedo compartment, had to put back to New York for repairs.

The *N-5* proceeded on with the *Whittemore.* During much of the day she was towed, connected with the schooner also by telephone. In order to relieve the crew from the strain incident to the long cruise, one-half were quartered on the schooner, and a shift including officers was made every 24 hours. They failed to sight any Hun. Otherwise, everything went well till the first week of September, when as they meandered along several hundred miles from land they ran into a heavy storm. The gale ripped the canvas of the schooner to shreds, and gave trouble to the *N-5,* for the pumps not functioning properly she flooded out her main motors. The two vessels then parted company, leaving Lieutenant W. S. Seibert, U. S. N., the commanding officer of the *N-5,* and half her crew on board the schooner. Her executive, Lieutenant J. M. Creighton, U. S. N., and eight or ten men brought her in safely, though not without some adventures.

When nearing Nantucket Light Ship, as they thought—they had been running for some time in a fog—instead of picking up one light ship they discovered four. Creighton, who was on the bridge, trusting that he had not been seen, tried to slip back into the fog. Whereupon he saw one of the ships detach itself from its companions, and head towards him. With his pumps out of commission, it was impossible for him to submerge. Therefore, in accordance with instructions, he hove to, broadside on, and began

making recognition signals. The steamer kept coming towards him, and by occasionally zig-zagging brought both bow and stern guns into action. She fired 30 rounds, non-ricochet shells, which if they had ever struck would have ended the *N-5*, but fortunately all were over or short. When she was about 1000 yards away, Creighton picked up the megaphone and hailed. Then the steamer changed to shrapnel, which fell 50 yards short. Finally, she got word by hail that she was firing on the U. S. S. *N-5*, broken down. The steamer proved to be an English transport. She never gave her name, but with the assurance, "We'll report you by radio," she departed in the fog.

There are so many stories told that show the inadequacy of the recognition signals, or the ignorance displayed by those to whom they were made, that it is worthy of note that the *N-7*, when off Nantucket in thick weather, met the destroyer U. S. S. *Bell*, Commander Douglas Howard, U. S. N., commanding, and made recognition signals without disaster.

Another class of service given to our submarines, when the Germans became active off our coast in the summer of 1918, was the assisting in the escorting of troop ships until they were several hundred miles out to sea. The fear was that a Hun, if he succeeded in sending home a torpedo, would later hover near the doomed ship as it fell behind and shell the American troops in lifeboats and on rafts. It might be impossible for the destroyer escort to prevent this if at the same time one or more Huns were also attacking the head of the convoy. It was believed that the Germans would take especial pleasure in such a feat for its advertising features; to announce that their submarines were destroying American troops by the thousand before they were past the mid-Atlantic would have been as cheering in their gathering gloom as the advance of several miles towards Paris. Some idea of the difficulties of this escort duty may be had from the records of the *O-4* and the *O-6*.

From the War Diary of the U. S. S. O-4

18 July, 1918.—[Lieutenant Commander R. H. English, U. S. N., commanding.] Shoved off from dock at 1.30 p. m., with U. S. S. *Bagley* as escort, and proceeded to Ambrose Light Ship. Arrived at 4.30 p. m. and lay to while awaiting formation of convoy. Made stationary dive to get trim. At 7.30 p. m. headed course 89°, trailing convoy, speed 12 knots. Passed Fire Island Light Ship abeam at 9.50 p. m. At 10.30 p. m. changed

course to 144° and maintained this general course during night, running without lights and keeping stern light of escort in sight.

19 July.—At dawn nothing could be seen of convoy. At 5.00 a. m. sent signal to escort asking when they had last seen convoy; to which they replied they had not seen them since rounding Fire Island Light Ship. Dismissed escort at 5.15 a. m. and continued course 144° (true), speed 12 knots. At 5.30 a. m. sighted convoy on port beam. The weather being hazy, the outlines of ships in convoy could be seen but faintly. Lost convoy when the U. S. S. *Walker* crossed in its wake. Picked up convoy again about 7.00 a. m. Trailed convoy as rear guard throughout the day, keeping ships just within sight through glasses. At 3.00 p. m. slowed speed to 11 knots in order not to crowd too closely. Sea rough, but not heavy. Wind 4 from northeast. Almost entire crew suffering from seasickness, except a few continuous service men.

On the 21st the weather had calmed, and the men on the *O-4* recovered from seasickness. She continued on her easterly course trailing the convoy until the 24th, six days out from New York, when, nothing eventful having occurred and her service with the convoy being completed, she came about and followed a generally westerly course. While returning the crew had practice in submerging and preparing to make an attack. When nearing New York they were fired on by a steamer, 12,000 yards distant; but as her nearest shot fell 4000 yards short, their peril could not be regarded as imminent.

Much more disquieting was the experience of the *O-6*, which, like the *O-4*, was one of our newest submarines. She was equipped with a three-inch gun, and had had target practice at the patrol boat range, Cape Cod Bay. Lieutenant C. Q. Wright, jr., U. S. N., was in command, and he had as his complement, three officers, and 35 men, which was fully a third more than many of the submarines had.

From the War Diary of the U. S. S. O-6

6 August, 1918.—Under way at 2.30 p. m. Stood out to Cape Henry. Submerged and obtained trim. Stood down to 2 C. B. Buoy and awaited convoy. Convoy arrived off Buoy at 8.10 p. m. Under way at 8.34 p. m. on course 86° (true), speed 12.5 knots, two miles astern of last ship. Convoy carried no lights. Saw blinker tubes several times, but nothing else. Night uneventful.

7 August.—At sea on course 90° (true), en route to convoy rendezvous. Nothing in sight at daylight. Position at 8.00 a. m., 37-00 N.; 76-06 W. Heard gun firing. Picked up four ships bearing on starboard bow. Assumed they were our convoy, as in haze they appeared to be. Came in behind them and checked course as 90° (true). The last ship was the only

one made out distinctly. Drew up to about two miles astern of last ship, and then slowed down to keep that distance. Now made out a total of 24 ships. We assumed that our convoy had made junction with New York convoy, but followed to make sure of junction before returning to Delaware Breakwater. At 3.05 p. m. (75th mer. time) the last ship fired at us, the shell landing close alongside, one to two feet to port and exploding. This ship had a three flag hoist up, which we could not make out, but took for recognition signal. We had hoisted the answering pennant and made reply. Sent men on deck below to get ready to submerge, and stopped the engines. I stayed on the bridge and began waving a flag. The next shell landed just forward of the bow and ricocheted over the bridge. Went below and submerged. The next shell hit the conning tower, and about the same time one hit the steering stand. The next one hit the engine intake pipe. All started to leak. Secured lower conning tower hatch, and flapper valves of others. Voice pipe from conning tower leaked badly; the valve would not close, and water poured over motor controls and wireless. Plugged voice pipe with a potato masher and kept some of the water out.

Headed away from firing ship, until starboard motor controller shorted and blew circuit breaker, and wireless started to spark and short circuit, when I blew tanks and sent men on deck with flags. Starting the engines, we headed away from the firing ship. One destroyer gave chase. After getting tanks dry and reaching a position beyond range of firing ship I stopped the engines, and sending everyone on deck with lifepreservers, and with all available flags attempted to signal to the destroyer. She then swung broadside to and fired several broadsides, all falling short.

Began signaling with whistle. The destroyer finally came within hail, and turned out to be No. *10* (U. S. S. *Paul Jones*). Her commanding officer said he could not make out our signals; that he was with a British merchant convoy, and when the last ship reported a submarine he had turned around to chase us. Requested him to convoy us to Delaware Breakwater, as it was dangerous for us to submerge. He radioed the admiral in charge of the convoy and obtained permission.

Lost overboard: Captain's Orderbook, Navigating Notebook, and chart. Damage done: superstructure hit near gun, and slightly damaged; gun hit and probably ruined; conning tower received two direct hits, one piercing, the other denting; steering stand pierced; engine induction pipe pierced; c. t. shears pretty well cut to pieces, and many pipes and electrical leads out; port side light gone.

The British merchant ship that had first fired on the *O-6* showed excellent gunnery, and it was really remarkable that although the captain, executive officer, lookout, quartermaster, and chief gunner's mate of the submarine were on the bridge at various times during the action, no one was killed or wounded. Target practice of this kind, however, must be a bit trying on an officer's nerves.

In the story of the many submarines engaged in patrolling the North Atlantic coast there is a great deal of sameness, but we cannot leave this part of our narrative without an account of the

THE "E-2" JUST IN FROM A LONG AND WEARY PATROL.

later adventures of the *E-2*. In spite of the fact that she was a tiny little craft (of 287 tons, surface displacement, 134 feet 10 inches long, 14 feet 6⅞ inches beam), and of so distinctly an earlier type that she had been for years out of commission, she gave an extremely good account of herself in the summer and fall of 1918;

the crew that Lieutenant Reifsnider had worked so hard to train stood a patrol at one time of 19 days, and in the seven months between 1 April and 26 October, 1918, cruised on the surface 6039 miles and ran submerged 2414 miles—and this without a serious breakdown of the engines or a casualty of any kind. Further, it was the *E-2* that got so hot on the trail of the German *U-117*, sinking ships off Cape Hatteras, that the large enemy craft, 275 feet long, immediately changed her theater of operations to the northeast, and after a few more inglorious successes made for the other side of the Atlantic. Her commanding officer is reported to have remarked after the Armistice, "There was one little Yankee submarine that pretty nearly got me. He got so near that it wasn't any fun."

On leaving Newport the *E-2* had gone to Hampton Roads. With this as her base she was ordered out on patrol. The War Diary relates that on her return she passed in the heavy fog a British steamer, which hove to and trained guns on her. But the signals were at once recognized and the two vessels proceeded on to Cape Henry. Not always was the peril so easily averted. This was shown, a half month later, by another chance meeting not far from Chesapeake Bay Buoy No. 2, where the channel is narrow and not very deep. In order that American submarines might not add to the nervousness of the merchant vessels, who were by this time seeing German submarines in every low dark craft, and also that they might not subject themselves to needless risks, they had been strictly ordered to avoid showing themselves to passing surface vessels. Consequently, when the *E-2* was on her way out from Cape Henry, running submerged, and the radio operator, listening on the K-tube, announced a steamer approaching, on bearing 270°, the commanding officer proceeded rather cautiously. Again the radio operator announced the steamer, with the same bearing, only her propellers sounded louder. As yet the *E-2* had not a great deal of confidence in the K-tube as an instrument of precision, and further there was so little room in the channel as not to invite extensive maneuvering. So it was decided that the safest course was to go to the bottom, which gave a depth of 50 feet, and rest there. Soon it required no K-tubes to tell them that something was approaching; the churning of the propeller blades could be heard through the hull, and it sounded louder and louder. Just before it reached its maximum, they felt

ACTIVITIES OF THE "U-117," 12-27 AUGUST, 1918.
(As plotted by the Hydrographic Office, August, 1918.)

No.	Date	Name	Nationality	Location	Remarks
1	12 Aug.	Str. *Sommerstadt.*	Norwegian.	Fire Island Light Ship 293° 45′ (true) 25 miles.	Torpedoed.
2	13 Aug.	Str. *Pyrrhus*.....	.....	Fire Island Light Ship South (true) 1 mile.	Steamer sighted submarine and sent out warning.
3	13 Aug.	Str. *Frederick R. Kellogg.*	American..	Ambrose Channel Light Ship N. (true) 30 miles.	Torpedoed, salvaged.
4	14 Aug.	Sch. *Dorothy Barret.*	American..	38° 54′ 74° 24′	Shelled.
5	14 Aug.	Sch. *Madrugada*..	Brazilian...	37° 50′ 74° 55′	Shelled.
6	16 Aug.	Str. *Mirlo*	British	35° 30′ 75° 18′	Torpedoed.
7	17 Aug.	Sch. *Nordhav*.....	Norwegian.	35° 42′ 74° 05′	Shelled.
8	20 Aug.	*Ansaldo*.....	Italian	38° 57′ 70° 48′	Gunned.
9	21 Aug.	*Thespis*	British	39° 54′ 69° 25′	Attacked by torpedo, missed.
10	21 Aug.	*Algeria*.....	Swedish....	40° 30′ 68° 35′	Allowed to proceed.
11	23 Aug.	*Bianca*	Canadian ..	Sambro Light, NW. by N. 100 miles.	Bombed, salvaged.
12	27 Aug.	*Pluos*.....	American ..	45° 10′ 60° 50′	Sunk, bombs.

themselves moving; the depth gage showed they had risen four feet. The suction of the propeller was lifting them. Then they felt a slight shock, heard a sound of scraping, and their boat dropped rather heavily to the soft bottom. There was a common feeling of relief as the noise of the steamer died away in the distance and they discovered that the shell of the *E-2* was still whole. An hour later, when they came to the surface, they found that the steamer passing over them had struck their forward stub mast, cutting and bending it. This, on the extreme bow, was only two or three feet high. Had the steamer gone about thirty feet to the south in the channel, she would have struck the conning tower, and there would have been no further tidings of the *E-2* and her crew.

The *E-2* then kept on to her billet off Cape Hatteras, and in this patrol cruised for 80 hours submerged and for 62 hours on the surface. Commonly, the difficulty when running submerged was in keeping warm, but here, where they were evidently operating in the Gulf Stream, they had the opposite experience. The temperature in the central operating space—the *E-2* was all one compartment—was 93°, and between the engines 114°. At all times when submerged there was discomfort caused by the boat's sweating. This worked hardships to the crew as shown by the record of one of them being taken with chills and fever and another being laid up with rheumatism; further it was a constant menace to the electrical installation. In this particular the German boats with their wooden sheathing had an evident advantage.

In the next patrol the *E-2* came upon signs of U-boats' work. While running with periscope exposed they sighted the wreck of a schooner bottom up. On coming to the surface they found the vessel, which was about 160 feet long, drifting with several shell or bomb holes through the bottom.

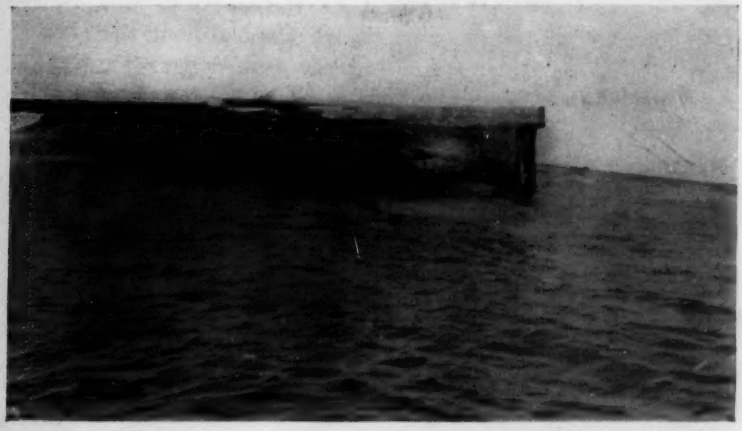
It is interesting in this patrol to note the record of time when they ran submerged: 10 July, 9.4 hours; 11 July, 12.9 hours; 13 July, 14.1 hours; 14 July, 17 hours; 15 July, 13 hours; 16 July, 13.1 hours; 17 July, 13 hours. On the 14th, when they made their longest run, the War Diary reads:

> Made one dive this day.
>
> Submerged 17 hours at 4 knots.
>
> Submerged at 4.30 a. m., and came to surface at 9.30 p. m. During the entire run, vessel was controlled by bow rudders only and no change in ballast was necessary.
>
> Air purifying apparatus was started during the ninth hour.

After the fourteenth hour the breathing of the crew became more rapid, though no other effects were noticed until coming to the surface after 17 hours. When the conning tower hatch was opened, a fog formed in a low line throughout the vessel, and an odor akin to sewer gas was noticeable; three men immediately vomited, and several others had headaches, but no lasting bad effects were apparent.

It was no small achievement at the end of this patrol to report: "Personnel maintained good health and spirits, though conditions were trying due to length of time submerged."

It was at this time after the *E-2* had returned from her third patrol that the *Helvetia,* a three masted schooner, was fitted out



WORK OF ENEMY RAIDERS AS SEEN BY THE "E-2" WHILE ON PATROL.

by the Navy Department to operate with our submarines against enemy raiders. On her were stowed spare parts, stores, and battery water. She carried a deck load of fuel oil in barrels. Her cargo hold had been converted into crew's quarters, and several additional deck houses had been built. The schooner flew a commission pennant and carried a naval crew. Entirely unarmed, she relied on the accompanying submarine for protection. Associated with her as the task force, were the *E-2* and the *L-5*. The plan was that the submarines should alternate, one trailing or being towed by the schooner, and the other operating independently. At five day intervals they met at an appointed rendezvous and relieved each other. The schooner carried special lookouts in her crosstrees and on sighting anything reported to the task

commander on board the schooner, who in turn sent the necessary information and instructions to the submerged submarine.

It was on 8 August, only two days after the sinking of the Diamond Shoal Light Vessel and a steamer in that vicinity, that the force under the command of Lieutenant Commander L. D. Causey, U. S. N., secretly left Hampton Roads, the two boats departing in the early evening and running submerged. The next morning at 7.00 the *E-2* met the *Helvetia,* while the *L-5* cruised independently according to the general plan.

At about 10.00 a. m. the *E-2* took the end of a 300-foot wire cable, seven-eighths of an inch in diameter, from the schooner and securing this to her towing hook was towed astern. At first she submerged to periscope depth, but when at noon the *Helvetia* signaled that a steamer was ahead, she went down to 60 feet and remained at that depth until the steamer had passed. Towing was not always the simplest matter, as will be seen from the following:

1.50 p. m. *Helvetia* came about, but made a good deal of leeway before filling away on the new tack. This loss of speed caused the *E-2* to go down to about 70 feet. We used motors in attempting to maintain proper position, and adjusting pump to get positive buoyancy. On coming to periscope depth we found ourselves close alongside the *Helvetia's* lee bow and heading bow to stern. The towing hook had been released before we came to the surface, but the cable had not released due to its lead abeam.

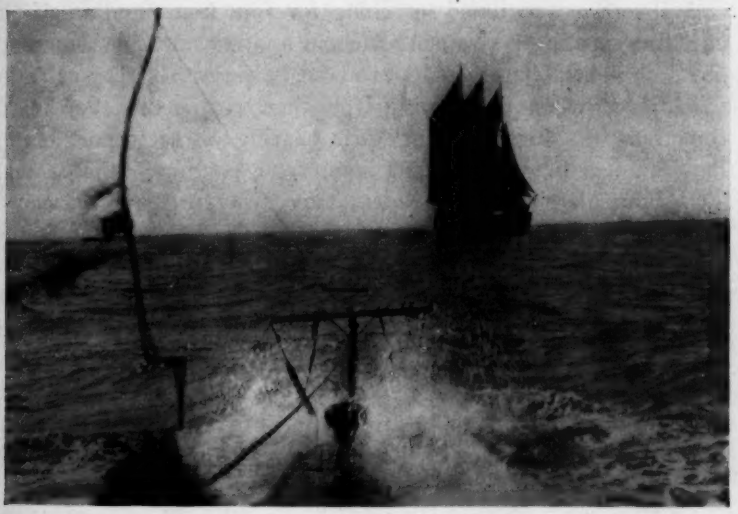
It was on the 17th of August, nine days after leaving Hampton Roads, that there came what promised to be the great opportunity of the *E-2,* but what turned out to be the great disappointment. Since early morning just before dawn the *E-2* had been submerged, trailing behind the *Helvetia* in the monotonous patrol, which continued for seven hours without a single communication from the schooner. And when at twenty minutes of one, the *E-2* came up at periscope depth under the weather quarter of the *Helvetia,* the only message the latter signaled was, "Can give you a tow line." In order to make fast the tow line, and to give the crew a slight relief, the *E-2,* six minutes later, came to the surface on the weather side of the schooner.

While the crew were preparing to make fast the tow line, the commanding officer sighted a bark to leeward, hull down. This surprised him, for according to orders he was not to expose the submarine when any vessel was on the horizon, and to guide him in his movements he was to be informed by telephone or signal

when any was sighted. Later, when he had dropped astern on the tow line, he noted that the bark had changed the appearance of her sails. Picking up his binoculars, he was puzzled by sighting two objects: one that looked like a square sail on the horizon, evidently the bark, but also another to the left that appeared to be the top of two masts coming up over the horizon.

Immediately he signaled to the *Helvetia,* "What is that to left of bark?"

"Can't make it out," came the reply.



The "E-2" Following the "Helvetia."

A few minutes later this vessel to the left was seen to be rapidly approaching the schooner by crossing ahead from port bow.

Orders were immediately given on the submarine, "Open towing hook! Rig for diving!" At the same time the *Helvetia* signaled, "Better prepare for trouble."

As there was no strain on the tow line, the towing hook did not open, and nearly a minute was lost in sending a man forward to open it and cast off the line—a long and anxious minute, for the commanding officer had made out the approaching vessel to be a large enemy submarine.

Starting ahead on both motors, he made a quick dive to thirty feet. With the eager expectation of finally engaging a German

submarine, he ran submerged for several minutes, making all torpedoes ready for firing. Meanwhile he was calculating the probable position of the enemy (four and a half miles distant when last seen), taking into consideration her speed and course. When he thought he was near, he slowed down to four knots, and porpoised, but failed to sight any vessel except the *Helvetia*. Next he gave orders to stop the motors, and the radio operator listened on the "ells" but could hear nothing. The more sensitive Y-tube, having been carried away in the course of the towing, could not be used.

And so they continued searching for four hours and a half, at one time sighting a swamped lifeboat and considerable wreckage but nothing with it. Finally at about half-past six they came to the surface, when, on learning from the *Helvetia* that they heard something on their listening gear bearing on their port beam, they immediately submerged again and continued the search. Two hours later when darkness took away the last chance of sighting the foe, the officers and crew of the *E-2* reluctantly admitted that the wily Hun had eluded them.

The German as later learned, was the *U-117*, Kapitänleutnant Froschen. She was said to have been put into commission in the beginning of the summer and had left on her first cruise—to America—about the middle of July. On the 10th of the next month she sank eight small fishing schooners off Nantucket shoals. After sinking a steamer off Long Island she proceeded down the coast laying mines at regular intervals between Sandy Hook and Cape Hatteras. She was just finishing with a Norwegian bark, when the *E-2* first sighted the two, and had evidently intended next to attack the schooner, but took fright and fled. Her next sinking of ships was in the vicinity of Cape Race, New Foundland, and it was not long before she was on her way home.

The *E-2* had failed to destroy the German raider, or even to get within striking distance. Why she had failed was well characterized by the commander of Submarine Division Two as he forwarded the report of the operations of the *E-2*, 8-27 August: "... It is lamentable that the schooner which was to be the eyes of the force should have failed at this critical time to carry out her part of the program." This was the only good opportunity to sink a German submarine in home waters that ever came to our boats, and the opportunity was lost because the personnel of the

Showing
and 26 Oct

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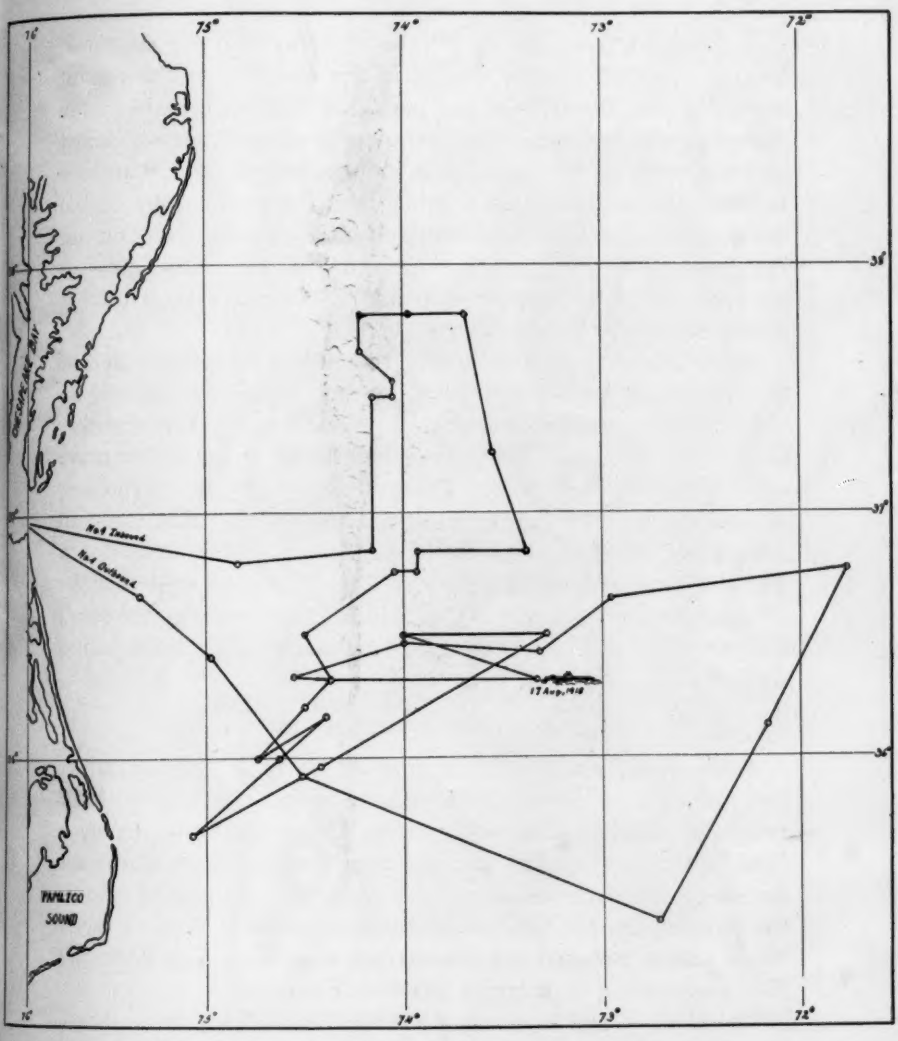


OPERATIONS OF THE U. S. S. "E-2," 8-27 AUGUST, 1918.

Showing the fourth of six patrols she made against enemy submarines. Between 1 April and 26 October, 1918, she cruised 6039 miles on the surface and 2414 miles submerged.

Helvetia had been lax in doing the most important thing assigned them.

It appeared from the log of the schooner that the masthead lookout reported at nine o'clock in the morning of the fateful day an object alongside of the bark, but that the captain of the *Helvetia,* who had seen but a few months of naval service, failed to report this to the task force commander, as by instructions he should have done, even if it had been the merest point on the horizon. Had this information been passed on to the *E-2* during the morning or when she first came to the surface, it is not at all improbable that creeping up on her busy and unsuspecting enemy she might have torpedoed her.

There was an exhibition of the good nerves and clear vision of the officers of the *E-2* early next morning, when they sighted an object to southward that sure enough was a submarine standing towards the *Helvetia.* They dived, and starting towards her made all preparations for attack. The sea was choppy, but porpoising at intervals they kept a favorable bearing on the submarine and approached to a position, 500 yards distant, where there was a fair chance of sending home a torpedo. Then they made out the recognition marks of the *L-5,* which the rough sea and the small amount of periscope exposed had prevented their recognizing sooner.

2. THE PATROL ABOUT THE AZORES

A few months after our declaration of war a German raider had appeared off Ponta Delgada, and tested the temper of the people by saluting them with shells. It may have been only a feint, but it gave rise to the suspicion that the enemy had their eye on the important shipping in the vicinity. To guard against the danger, the United States early placed there a small naval force, which included the submarines *K-1, K-2, K-5, K-6,* and *E-1,* constituting Submarine Division Four.

The *K-2, -5,* and *-6,* as they left the Philadelphia Navy Yard, 7 October, 1917, for New London, supposed that they were merely to be the training division at the Submarine Base. The idea that they would be the first boats to go across hardly entered their minds, because requests for housing periscopes, bridges, and other equipment believed to be necessary for war work had been disapproved. When they reached New London, they received an order

that no one was to be allowed ashore except on duty and by express permission. This mystified most of the officers as much as the men, and they could only speculate what it meant. On the 12th, when they had been joined by the *K-1*, they sailed for Provincetown and then to Halifax—still not knowing what was to be their duty.

Officers of the "E-2" on Returning from Patrol.

At Halifax, after taking on fuel and 10 days' provisions, they were given a sealed package of charts, with instructions not to open them until ordered to do so. It was only as they were well out of Halifax, when they read the signal flying from the tender U. S. S. *Bushnell*, "Destination, Ponta Delgada," and opened the charts, that they understood they were bound for the Azores and for service "over there."

They had a rough, disagreeable passage, and as only one of the boats had a bridge, they found some difficulty in operation. On one of their number the lookout sat out his watch on a saddle rigged up on the periscope; on another, he was described as perched "astride the periscope shears, hanging on for dear life—the boat sealed up with the exception of the induction valve, and the cold seas washing completely over the conning tower." The more serious feature was the frequent minor break-downs of engines on two of the submarines, because of which all had to lie to and drift while repairs were being made.

It was a welcome relief that came on the evening of the 27th as they entered Ponta Delgada and secured alongside the *Bushnell*. Life took on the aspect of luxury as they had a bath and shave and turned in for a real sleep.

But the rest was brief. At four the next morning, working parties were turned out to unload from the *Bushnell* stores, provisions, spare parts, and personal belongings. Officers and men were so busily engaged that they did not stop to ask where they were going to live. The unloading was carried on with all haste possible, the supplies being put on the dock near the fish market, and carted from there up to a small store house near the main square of the town. It was a strange atmosphere that they suddenly found themselves in, and one officer relates that in spite of the hurrying he could not close his eyes to the funny little Portuguese children scooping up the sugar that dropped from an occasionally torn bag, eating it with an equal amount of dirt with greatest delight.

About midnight, they saw the reason for the haste, when the *Bushnell* cast off and sailed for home. She was returning for the next division of submarines, which was to go to Ireland. The U. S. S. *Tonopah* had been designated as the tender for the Fourth Division; but as at this time she was engaged in renewing her boilers, it had been decided, rather than to delay sending a force to the Azores, to leave them for a while without a mother ship—an evidence of the urgent need and also of the Department's confidence in the resourcefulness of our young officers.

The breakwater, along which the submarines were secured, was to be the home of officers and men for several weeks, and certain phases of their life were so primitive that they jocosely spoke of themselves as "cave dwellers." It is described as "up-

Division Four at Ponta Delgada.

wards of half a mile in length, about 40 feet in height, consisting of a series of arches filled in with cement and stone blocks on the sea side, where it is further strengthened and protected by huge boulders and rocks which are brought down from the quarries from time to time, and dumped into the sea. On the land side, a shelf, perhaps 50 feet wide, and about six feet above the water level, forms a platform on which there may eventually be built docks and ship wharves. During our stay there were big piles of sand heaped on this platform."

Of their life there we have the following picture:

Left to our own devices, we set to work to make these "holes in the wall" habitable [the arches were about 25 feet high, and gave a floor space of 30 by 20 feet]. One was designated the "Office," in which the boxes of records were placed; planks laid across the boxes made a table for the yeoman, who soon had his typewriter set up and the "Incoming" and "Outgoing" baskets ready for business. One corner of the Office was given over to the stowage of the officers' trunks and personal effects. Some one found an old ship's ventilator, which inverted with the large belled mouth turned outboard made an excellent fireplace, in which we soon had a roaring driftwood fire. Adjacent holes were allotted to each boat, and the men turned to building bunks and bag racks. Another hole became the crew's mess hall and galley. Wood, canvas, and scraps of tin and sheet iron found about the breakwater were pressed into service to help convert the seawall into a home.

On 1 November, the *K-2* left for the first patrol in an area around the island of San Miguel. She encountered heavy weather before her return, and the cave dwellers also had a full experience of it.

A southwest blow with heavy rain squalls reduced our home to a sad condition of dampness and chill. Huge seas, driven before the gale, hurled themselves at the breakwater, sending green water completely over the top, and swirling in back eddies into the holes. Clothes, bedding, records, everything we had, was drenched with salt water, and even our fireplace failed in its efforts to cheer us up. A council of war was called to decide the question of more suitable quarters, and it was agreed to try to rent some place in town where we could at least stow our belongings. This resulted in the rental of the third floor of the Hotel Novo Central—a loft up under the roof, whither we sent our trunks and where some of the officers tried to sleep. More spacious or better furnished quarters were not to be had, because the Division was without a paymaster, and the division commander was not authorized to expend funds. For the enlisted men, we obtained the use of a school room in town, where half the crews of all boats could alternate in sleeping—this with the idea of getting the men out of the boats as much as possible between patrols. Empty gasoline

drums were converted into shower baths, and every effort made to give the men a change of surroundings.

The following month, the *E-1*, and the seven L-boats bound for Ireland by way of the Azores, had an unusually complete experience in navigating submarines through winter storms. Sailing from Newport on 4 December, they ran into a hurricane, and heavy seas washed over them during most of the trip. Lieutenant J. C. Van de Carr, U. S. N., who had the *L-10*, notes in his War Diary, "The boat rolled as much as 69° on a side. About one-half the men are sick, a few very sick . . . . It was the worst storm I ever encountered in a submarine, and was probably a record for our submarine navy." The most detailed account is the record of the *E-1*, commanded by Lieutenant Eric L. Barr, U. S. N.

Adapted from the War Diary of the U. S. S. E-1

7 December, 1917.—The promised storm arrived about 10.00 last night. At one o'clock the commanding officer was called to the bridge by the officer of the deck, who reported that the towing tug had stopped and we were in danger from the *L-11* drifting down on us. Immediately we made preparation for letting go the tow line. The wind was blowing a gale from the northeast, and the seas were running high. It proved that the tug had not stopped, but could make no headway against the wind and sea. The word was given to slip the tow line, but for some reason it would not slip. To send a man forward to release it would have been futile, and like sending him to certain death. Closing the releasing gear, we hung on.

The storm increased in violence, and at 3.00 a. m. we were driven from the bridge by heavy seas which broke clear over us. Securing what we could, we cut away what was left of the bridge screen that we might have an unobstructed view through the eye ports, and then sealed up. The steersman steered from the conning tower, where he could just make out the towing lights of the tug, but the air got so bad in the conning tower that we had to relieve him every half hour. Krug, seaman, took his turn, but being too weak to stand had to give up. Elmore then took double watches. Thus we kept on till daylight. The tug had, meanwhile, made repeated signals for us to let go. We again released tow line, but could see through the periscope that the ring on the towing pennant had fallen back over the releasing bolt, as there was no strain on the hook to release it. After 20 minutes a sea lifted the tow line clear, and we were henceforth fighting our battle alone.

The wind shifting to the southeast, we started one engine and turned away from the tug and the *L-11* to get clear. A rain squall followed, and after it was past the *Bushnell* was nowhere in sight. The gyro compass, which had proved utterly unreliable in the heavy rolling, was stopped; the cutwater compass was from one to three points out, but it mattered little. We had to keep the seas ahead or a little on the bow, or we would roll so as to

take them down the engine induction. That was right over our after battery. As the battery deck covers of rubber were torn and worn out, nothing but painted canvas kept the salt water out of the battery. Salt water meant chlorine—a real danger when the seas were going clear over the bridge, so that no one could have stayed outside. To meet this new difficulty we stretched a hammock under the induction and led it to the midship well. This kept most of the water, and the rest we dried up with swabs and waste.

We had now lost sight of the *Lykens* [the tug] and the *L-11*. We kept on to the southeast until noon, when the wind changed to the southwest. Then running before it, we headed east northeast. The gale had by this time become a cyclone, and one sea that came crashing down on top of our after deck smashed in all the deck locker doors. The next one lifted them off, and with them off our mooring lines came out. One, fouling the port propeller and diving rudder, put them out of commission. Since it was impossible to get on deck to clear it away, we could after this use the port engine only for charging batteries. The wind hauling to the northwest, we headed around and ran before it about east southeast.

The darkness came, and still the seas would allow no one on the bridge. With the darkness it became difficult to keep before the sea, and when we broached slightly the seas flooded the engine induction. It was not long before we had to stop the engine, seal up completely, and run on one motor, batteries in multiple. After six hours of this the air became so oppressive that we were compelled to open the induction and run the engine a short time to ventilate the boat. We attempted no watch that night but ran blind. The officer of the watch would look through the periscope every five or ten minutes to see if by any chance a light was near. We were unable to show bridge lights, for ours had all been grounded in the first few hours of the storm. This had caused two fires, which were put out by cutting circuit below. The engine signals had also grounded and had to be disconnected. All but one electric cooker had grounded, but that did not bother us much as no one thought a great deal about eating. A few of us forced ourselves to eat a handful of crackers and a piece of bread at meal hours, but there was no pleasure in it.

The steersman, seated on the forward end of the table, was lashed in place. He did well if he kept to a point and a half either side of the course. The engine room watch were the only ones on their feet. They had to hang on. If any one wanted to move about the boat he had to crawl. We were rolling from 45° to 60° on a side. To look through the periscope an officer had to hang on overhead, and more than once it happened that some one rolling across the deck knocked the officer's feet out from under him leaving him swinging like the pendulum of a clock.

8 December.—Morning came at last with indications of a clearing sky. We started the starboard engine, running at lowest speed to keep the racing within safe limits. The sky later cleared, but as the wind and sea continued high, it was impossible to get on the bridge for a sight. In the forenoon watch, Towers fell over at his work in the engine room and was too weak to get up. He was put in a bunk forward alongside of Krug.

Both were picked men, and held to their post until physically unable to stand. But they were new men and showed the need of training; the old men stood up and did their work.

At 1.00 p. m. we picked up a radio from the *Bushnell,* giving Bermuda as a rendezvous. That night when the wind and sea abated a little, we made good speed, floating the battery on the line to keep the propeller from racing.

9 December.—At 8.00 a. m. we sighted a big freighter through the periscope. Not being in condition to dive we changed our course two points to pass a little farther astern. He saw us at the same time, and putting on full speed began zig-zagging. Had he known how harmless was a submarine in that storm, he would have saved himself trouble. The roll of the boat brought the vertical wire of the periscope 10° off the bow, first on one side and then on the other. It would have been impossible to make torpedo adjustments. We received another radio from the *Bushnell,* but this was fainter. A near noon sight, obtained at much risk to the observer and the sextant, showed us about 270 miles to north and east of our position computed by dead reckoning. We distrusted the accuracy of our sight, but determined to buck the gales and waste no time looking for the *Bushnell.*

10 December.—The wind died down, but the overcast sky and rapidly falling barometer gave warning of trouble ahead. The seas were heavy with no apparent direction. Getting the gunner's gang out on deck, we attempted to clear the port propeller, but gave it up as every little while a sea would roll clear over the decks. The commanding officer took his forenoon watch on the bridge. The wind soon began in puffs. Then a new storm blowing from the south and later southwest broke. The bow radio mast went by the board, and one of the bow rudder guards was wrenched off, drifting to leeward. Very soon we were driven in off the bridge, and had more of the relentless pitching and rolling and the torture of stifling air. It was a repetition of the first day's storm, only more violent. In order to hold to our course we took the seas broad on the bow and let her roll. . . . .

12 December.—At daylight the sea was smooth but there was a heavy ground swell. Stopping, we cleared away the wreckage of the bow radio mast, and then running the radio telescopic mast two-thirds up we rerigged the antennae. The gunner's gang tried again to clear the line from the port propeller. Elmore, chief gunner's mate, having stripped went over the side with a heavy line around him, tended from the deck; swimming to the tail he stood on the skegs, then at a favorable opportunity dived and hung on to the skegs with one hand while he cut the five-inch line from the propeller with a knife. He had to go under three times before it was cleared, working as the boat rose and fell with the sea. He then examined the diving rudder, but he found this so badly fouled that he was unable to free it. Elmore showed that he had been knocked about, for he was bruised in a number of places, but not so as to be incapacitated for duty.

At noon we were able to get sights and exact position for the first time since separating from the rest of the fleet. We then changed our course

to southwest by west one-half west, speed 11 knots. Our port engine now began to slow down, because of dirt or some other foreign matter getting under the foot valves of the fuel feed pump.

13 December.—The port engine ran slower and slower, until finally we were compelled to give it a superficial cleaning. At noon we sighted a steamer two miles away. When she saw us she headed our way. As we could not dive, we had an anxious moment. Stopping with broadside turned towards her we hoisted No. 6 colors at the radio yard and began signaling by wigwag from the deck. She kept her guns trained on us, but did not fire. At 500 yards she stopped, looked us over, and decided to go on. She was the *Julius Caesar* of Genoa, bound for Norfolk. Stating that diving rudders had carried away, we asked her to convoy us to Bermuda, fearing that Allied ships mistaking our identity might fire. This took her one point off her course, but she came around and convoyed us to the south end of the island and sent a radio concerning our arrival. At 7.00 p. m. we approached the entrance of the harbor, exchanging signals by searchlight with the harbor patrol, who ordered us to lie off till daylight. We obtained permission to anchor on the 10-fathom line, which we did at 7.30 p. m.

14 December.—About 1.00 a. m. a thunder squall struck us, and at 2.50 a. m. when our anchor cables parted we began drifting towards the reefs to the northward. We got under way at 3.00 a. m., and steamed about the front of the harbor till daylight. We took a pilot aboard at 7.00 and stood into the harbor at 10 knots. We secured alongside the *Bushnell* a little before 8.00 a. m.

We moved into quarters in the casemate during the afternoon. The crew subsisted on Royal Navy rations.

15 December.—The commanding officer went on board U. S. S. *Prometheus,* which was tied to the inside of the quay to see about repairs.

The vicissitudes of the *E-1* have been given with considerable detail, but they were not more severe than those of the other boats in the division. In fact the *L-9,* which turned back and made Boston, encountered even rougher seas and in addition very cold weather. The honors of the voyage belong especially to the *L-1, L-2, L-10,* and *L-11.* These four, early becoming separated from the *Bushnell* as well as from one another, failed to catch the signal appointing Bermuda as a rendezvous. Left to their own judgment, they individually decided to risk a 1700 mile run to Ponta Delgada, through wintry seas, with machinery that had never before proved equal to such a test. In this they knew well enough that if their engines broke down they could expect no assistance from ships they were unlucky enough to encounter. But after many days of weather like that described, and other hardships such as diminished rations, they succeeded

in reaching their destination. The others followed about two weeks later, when minor repairs had been made.

The Fourth Division, whom they found at Ponta Delgada, had not encountered any Huns, but had now for two months and a half been making patrols with as much regularity as possible. They had been relying entirely on themselves for repairs, and it was a surprise to many that the boats could be kept going with so few facilities. For this the machinist's mates deserve no small credit. This division had as their area of operations the waters surrounding the Azores to a line 300 miles outside. This was much too large a zone for five small submarines to cover with any thoroughness. Patrol after patrol brought the same report of heavy weather, endless rolling, vast expanses of storm-tossed seas, but never a Hun and rarely a surface craft to vary the monotony. Most of the time they ran on the surface to cover as much area as possible on the usual lines of approach to the islands. When the big convoys, somewhat later, began to cross by the southern route, they would scout in the probable direction of attack by an enemy submarine.

On 23 November, 1917, the German radio press had proclaimed the existence of a war zone around the Azores, in which any vessels venturing did so at their peril. This aroused in the Fourth Division great expectations of meeting the enemy, but nothing came of it. As was learned later, the Germans published the threat in the hope that it would divert some of the Allied force concentrated about the British Isles. Reports of enemy submarine operations in the vicinity of the Azores were few and far between. Between the 24th and the 26th of November a raider sank five ships in the vicinity of Madeira; on the 12th of December a submarine shelled the town of Funchal, Madeira; on the 27th of December another sank a Portuguese barkentine south of the island of Pico, Azores. The first two were beyond the range of the American patrol, especially at a time when the fuel oil left by the *Bushnell*, a month and a half previous, had to be most carefully economized; the third afforded a chase in which all joined, but as the Hun had a start of several hundred miles and also the advantage of speed, they never had a chance.

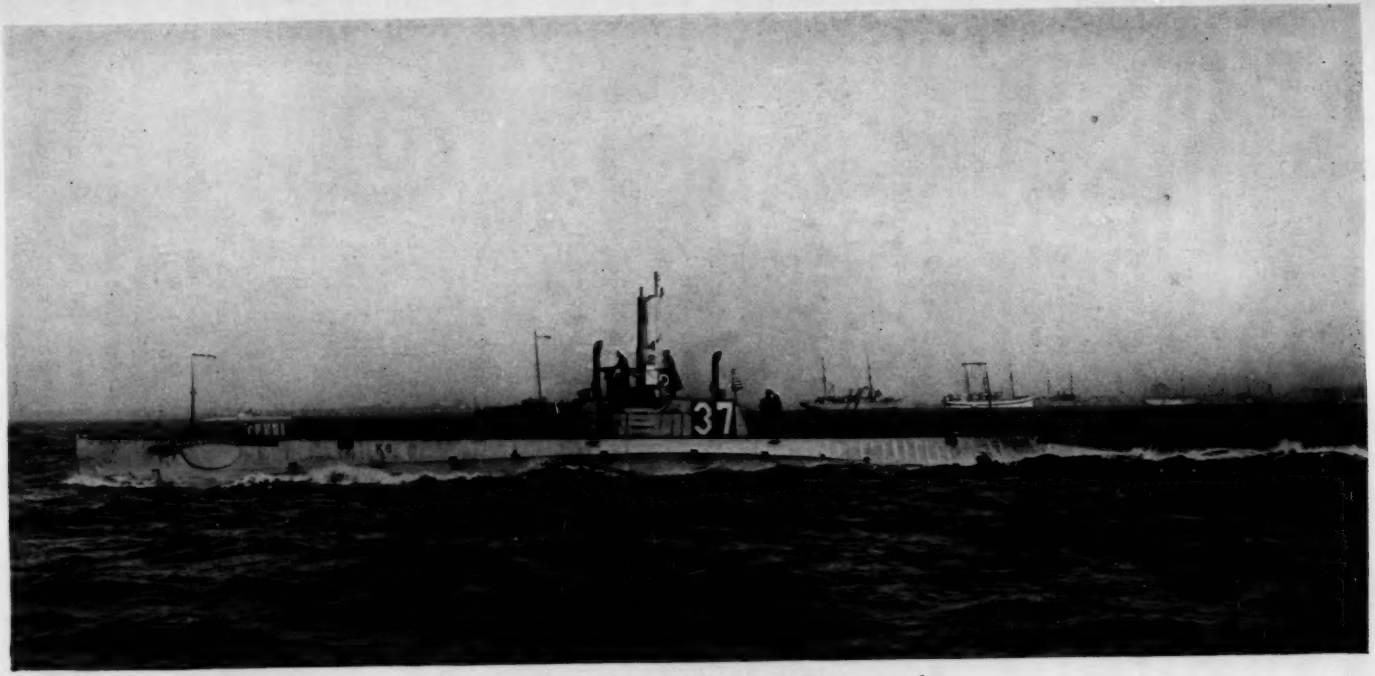
They attempted to make use of lookouts in the hills, who now and then reported a suspicious looking craft seen passing the island, but as these reports did not reach them till a day or two had elapsed after the craft was sighted they were not of great value.

One of the embarrassing features of the patrols was the breaking down of the engines. An officer writes:

Nurse them as we would, we could never be sure that the old two-cycle engines would stand the strain of long running in rough seas with propellers racing, and it was rather the rule than the exception for a boat to return with only one engine in operation, and that one sadly in need of repair. With the facilities for repair work of the poorest, and with very inadequate spare parts, the time in port between trips, which should have been rest periods, was devoted to engine overhaul—working the men in three shifts through the day and night, getting the machinery ready for the next patrol. The spirit of the men under these trying conditions was admirable.

An experience of the *K-6* gives a vivid idea of the weather that prevailed during the winter months and the unprotected state of the submarines. This is described as follows:

On the night of February 1-2, 1918, we were lying just to the southward of the entrance to Ponta Delgada. Heavy seas and a gale from the southwest compelled us to keep the motors turning over slowly in parallel, in order to maintain position, and to ease the motion of the ship. About eleven-thirty, an unusual pounding aft gave the impression that the seas had carried away a section of the tail plating—by no means an uncommon occurrence. Had this been the case, the plate would have eventually become detached and the noise would have ceased. But the pounding increased, seeming to be the worst when the boat was lifted on a wave and the tail slapped down into the trough of the sea. About twelve-thirty the signal was given to the man at the controllers to go ahead, in order to put her head up to the sea. A rasping, grinding sound immediately followed, that indicated only too clearly that the propellers were fouled. Then for a time it ceased; then recommenced as the stern fell into the trough of the sea again. Instinctively, something told us what had happened—the connecting rod to the after horizontal rudders had carried away, allowing the rudders to hang down vertically. As the boat pitched and tossed in the sea, these unattached rudders were swung over and under the propellers by the force of the waves, alternately hanging down clear of the blades, and the next instant thrown over on top of them. Already our propellers had been chewed to pieces in those few revolutions before we realized what was wrong, and we were helpless to maneuver the boat. In less time than it takes to tell, the boat had swung into the trough of the sea, and was rapidly making leeway to the northwestward. A look at the chart showed us that we were on a lee shore that promised us no soft landing place if some means of propulsion were not devised to keep us off shore. Galera Point lay dead to leeward—a sheer cliff rising right out of several hundred fathoms, without a sign of beach or shelf to land upon. Our propellers were useless; the cliffs were less than five miles away; had we had canvas for a sail, it wouldn't have lasted ten minutes in the gale that was blowing. So the captain radioed for assistance, and at four fifty-five a small mine sweeper stood out toward us. Dawn was just



THE U. S. S. "K-6," AT HAMPTON ROADS, 1916.

breaking when they attempted to run us a line. With the seas breaking completely over us, it was a difficult operation to handle towing gear. The first line, a 5-inch manila, parted as soon as the sweeper put a strain on it. Next they tried wire, but we were unable to handle it; only two or three men could go on deck at a time, and they could not haul the cable aboard. Two 5-inch lines were then run to us by the crew of a wherry that they launched and handled in excellent style, but both of these parted as the single one had done. In attempting to hoist the wherry again, the boat was dashed against the side of the sweeper, the crew escaping by jumping for the rail. It was now ten o'clock in the morning and we had been set in to within a mile and a half of Galera Point. If anything was to be done it must be done quickly. Acting on this thought, the captain of the sweeper put her head to the sea, and by skillful maneuvering, gradually brought her down upon us stern to. She came closer and closer until it seemed that we must inevitably crash into each other. Now her stern was abreast our bow; now her counter overhung our bullnose. If we rose on the next wave we would surely plow through her stern. But as luck would have it, the next wave lifted both of us together, and during that brief space of time, they had thrown the eye of a 3-inch wire sweep over the windlass casting on our deck—literally lassoed us. Just once we bumped as the sweeper started ahead—a glancing blow that made us hold our breaths but did no damage to either vessel. At eleven twenty-seven the return to port was begun. Hearts were never lighter than when we saw the rocky cliffs of Galera Point receding. In the days of work that followed, repairing the broken connecting rod to the rudders, and straightening the propeller blades, which had to be done by hand on a wooden form, the crew spoke jokingly of their "flirtation with Madam Galera."

During the entire period, of very nearly a year at this station, the American submarines never once made contact with the enemy. That was the hard, discouraging feature of their war service. They could stand what seemed like being forgotten for a while by home, as they waited for the *Tonopah,* braving the inconveniences and discomforts, but to be thus utterly neglected by the enemy took the spirit at times quite out of them. At moments they felt as useless and foolish as a policeman walking up and down an empty street. The Navy Department, however, looked on their service quite differently. They emphasized the fact that the Germans were keeping away from what they had proclaimed a "barred zone" in quite a different sense. This, as the Fourth Division were assured, "materially aided the routing of convoys by the southern route."

The Eighth Division

The Eighth Division, Submarine Force, consisting of the *O-3* to the *O-10* inclusive, was organized during the latter part of the

war for service off France, but since they got no farther than the Azores it may be mentioned here.

With their tender, the U. S. S. *Savannah* (formerly the Hamburg-American steamer *Saxonia*), they left Newport, Rhode Island, on 2 November, 1918. This division was especially well equipped and well trained, and was made up of our newest submarines. On their way to the Azores they had the not uncommon autumn experience of head winds and heavy seas. But they kept their formation on the *Savannah* and were constantly on the alert for enemy vessels that never appeared. Before they had reached the Azores, the Armistice had been signed. So after a brief stay they retraced their course to Bermuda and then went to Charleston, South Carolina. During a scant six weeks they had voyaged about 5000 miles, with two stops of about eight days each.

The performance of the *O-5* on this cruise was particularly creditable. When the plans were maturing for sending the Division across, this vessel had suffered a sad accident, caused by the failure on the part of a recent addition to the crew to attend to the ventilation when the batteries were being charged, with the result that hydrogen collected and exploded as the hatch was opened suddenly. In consequence the commanding officer, Lieutenant Commander G. A. Trever, U. S. N., and the third officer, Ensign (T) W. J. Sharkey, U. S. N., lost their lives. Lieutenant Commander R. H. English, U. S. N., in spite of the fire that followed the explosion, immediately entered the boat and with noble devotion risked his own life to rescue Trever, who was still alive, from the mass of wreckage under which he had been buried. This happened on 5 October, 1918, and for nine days Trever battled for life but finally succumbed after having both legs amputated.

Lieutenant Commander L. F. Reifsnider, U. S. N., who had previously had the *E-2*, was then ordered to this command. When he came to his new ship, a week and a half after the disaster, he was confronted by utter confusion. Nothing had been done beyond clearing out the wreckage, and the destruction caused by the explosion and the fire that had raged for several hours after gave a most disheartening appearance. Further, the crew were not far from a state of demoralization. Repair work was begun at the New York Navy Yard, where the vessel was lying, but the other boats of the Division coming here at this time required to be docked preparatory to the trip to European waters; and their

needs drew men from the *O-5*. When the Division left, the latter part of October, going to Newport for final preparations, they expressed to the officers on the unfortunate ship sympathy on their being left behind. It speaks well for the officers and crew of the *O-5*, and for the efficiency of the New York Navy Yard, that 25 days after the explosion had wrought such havoc, the *O-5* went to sea for war service, and she went in time to sail with the rest of the Division for the Azores. They had some troubles with the engines at the start, causing the *O-5* to be towed a short time by the *Savannah*, but they soon corrected all difficulties, and before the end of the voyage this ship was among the most reliable.

The Third and Sixth Divisions

While long voyages are being considered, mention should also be made of what the Third and Sixth Divisions accomplished. The former, which consisted of the *K-3*, *K-4*, *K-7*, and *K-8*, carrying their base along in a rickety collier taken from the Germans, proceeded from Hawaii to Key West, and there took up the tedious grind of off-shore patrol, covering the Straits of Florida and the Gulf of Mexico. This was a very efficient division, and had not the outbreak of war found it at Hawaii, it would very likely have been the first in the war zone. The Sixth Division comprised the *L-5*, *L-6*, *L-7*, *L-8*, and *Alert*. The last, formerly a sailing ship, was one of the oldest ships in the Navy; it had been supposed that she would end her days at Hawaii, for the reason that she would not be able to get anywhere else to die. But she sailed with the Third Division to the Atlantic coast, and later with the Sixth Division, which had been ordered to the Azores about the same time as the Eighth. Both divisions had about the same kind of weather, but it was harder on the Sixth, for the boats being older encountered greater difficulties in the heavy seas. Arriving at the Azores, the Sixth, like the Eighth, were turned back on the signing of the Armistice. On the return voyage, they received orders at Bermuda to proceed all the way to San Pedro, California. It was an extremely long voyage, but they made it without trouble to anyone except themselves. This was commonly regarded as one of the best long-distance, seagoing performances ever made by our submarine navy, perhaps the best.

(TO BE CONCLUDED)

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RADIO COMPASSES

By LIEUT. COMMANDER J. B. WILL, U. S. Navy

The number of questions asked the writer by officers of all ranks on the subject of radio compasses leads to the belief that a non-technical discussion of them may prove of interest to the service.

To most persons not directly connected with radio work or the navigation of ships, the term radio compass means little. It probably appears to them to be something of purely academic interest. That is because the development of radio compasses is a comparatively recent one, and its influence has not yet been apparent to a great extent. The subject is, however, of direct and growing importance to each of us, and is therefore one which we should know something about.

It affects us in time of peace and in time of war. In time of peace chiefly because it is a new and potent factor in navigation. Navigation affects commerce and commerce affects all civilization. Think of the money that will be saved in future years by ships being able safely to navigate in fogs! Not only will the saving in the number of ships wrecked or damaged by grounding in fog, be considerable, but the amount of time and anxiety saved by having valuable ships enter port instead of lying off, waiting for the fog to lift, will be enormous. In time of war, the information obtained by the radio compass as to the location or bearing of enemy or of friendly forces, is most valuable and will be more so as the radio compass becomes better known and better developed (which will inevitably be the case).

The following examples of the use of radio compasses may be cited. When the transport *George Washington*, with the king and queen of the Belgians on board, was approaching New York harbor about the time this article was written, U. S. naval radio

compass stations plotted and transmitted to her her positions at short intervals as she approached Nantucket and Long Island, and this procedure was followed until she reached Ambrose Channel, thus providing an additional safeguard to the vessel and the lives of those on board; and furthermore the position of the *George Washington* at 2.15 p. m., on October 1, as obtained by the radio compass was known to the authorities in Washington at 2.30 p. m. of that date.

Shrewd observers in London during the war are said to have noticed that on the nights when there was to be an air raid, searchlights were not tested. The reason the British authorities knew in advance that the Zeppelins were coming and when to expect them, was that the courses of the Zeppelin squadrons were plotted from their radio signals with considerable accuracy, by the British radio compass stations.

Now just what *is* a radio compass? A radio compass, briefly stated, is a device for the directive reception of the electromagnetic waves used in radio telegraphy. The basic principle involved in directive reception has been known almost since the beginning of radio telegraphy, being simply that radio waves have most effect on an antenna or loop extended in the direction of the propagation of the waves and least effect when the antenna or loop is at right angles to the direction of propagation of the waves. A number of systems have been evolved for making practical use of this principle. Of these the two most widely used to-day perhaps are the Bellini-Tosi, which is the system usually employed by the British, and the Kolster which is the type used by the United States Navy. I will not go into the detailed description of either, but merely state that in both a pivoted vertical coil, which is part of the receiving system, is rotated by the operator until the position is such that the radiation from the sending station produces a minimum of sound in the head phone. The direction or relative bearing of the transmitting station is then indicated by a pointer on a circular scale.

It may be seen from this brief definition that the radio compass differs from the magnetic compass in that it requires a separate manipulation by a more or less skilled operator for each bearing obtained, whereas the magnetic compass provides a continuous indication automatically. Simple as this fact is, that it has not always been self-evident may be seen from the following inci-

dents which actually happened when radio compasses were first placed aboard United States destroyers. Questioned as to how the radio compass worked, one operator reported that he never could repeat his bearings. Upon investigation it was found that his method was to give the handle a twirl, thinking that the pointer would come to rest on the proper bearing. Another reported that he had been watching the compass for a number of weeks and it had not moved once! The necessity of a certain familiarity on the part of the operator with the principle involved is evident. One cannot expect perfect results with untrained personnel, and it is unfortunate that skilled operators are not always available.

You naturally ask, why, if the principles of directive reception are so simple, the development of radio compasses has been so slow. The great difficulty to be overcome was that while bearings could readily be obtained, they were usually in error, so that no confidence could be placed in them. The source of these errors has been found to be largely not in the compass apparatus (though that too has been greatly improved) but in the incoming waves themselves. These, whenever they encounter an antenna or a loop or a coil or a mass of metal which acts as an antenna, with the proper natural period, will set it to oscillating and a certain amount of energy will be re-radiated; a radio compass located nearby will then indicate not the true bearing of the sending station but the resultant, due to the energy of the transmitting station and that from the re-radiating antenna, which may be anything. Furthermore, the direction of the incoming waves may have changed due to some peculiar qualities or configuration of the intervening surface. To get good bearings therefore, the first step was to standardize conditions as far as possible. For instance, radio shore stations are now carefully located as to geographical position; the distance from any other antenna is carefully prescribed; all telephone, lighting, or other wires within a specified distance are buried; the building in which the compass is located is carefully constructed with metal work eliminated as far as practicable, according to approved specifications; the operating room is surrounded by copper screening; and the compass coil and receiving apparatus is itself of a standard type. When this is done the station will still probably show a certain error or deviation, so that it must be carefully calibrated, a

deviation curve plotted, and each bearing taken corrected before being used. The results, however, when this has been done are very good and can be accepted with confidence, as being correct within one or two degrees. There may be of course errors in calibration, and of operation; but the performance of United States Navy shore radio compass stations has been gratifying.

In the case of ship compasses the difficulties are greater, but by following the principle of standardized apparatus and wiring and of careful calibration, together with breaking up as many disturbing metal loops as possible, good results have been obtained, though in general not so good as with shore stations. Best results have been obtained in destroyers, about 125 of which have been calibrated by the Boston Navy Yard. Some of the new destroyers have shown as small as 3° maximum deviation, but the older types show considerably more. The destroyer type compass is much smaller and more compact than the type which was until recently placed on battleships. The latter did not as a rule obtain satisfactory results from their radio compasses, and the destroyer type compasses are now being installed on battleships. When one considers the number of antennas, shrouds, stays, guys and railings, and the masts, cranes and turrets surrounding the compass on a battleship, the problem of obtaining good results may be understood. Still, encouraging progress is being made.

During the war the British and French established numerous radio compass stations along their coasts and many of our destroyer captains first learned their value there.

The United States Navy also developed radio compasses during the war and now has approximately 20 shore compass stations on the eastern coast of the United States and is building stations on the west coast. These are available to all mariners and the service is offered free of charge. A mariner desiring the position of his ship has only to call the nearest control station and request his bearing by means of a conventional signal. Then upon receipt of an acknowledgment to transmit V's for a few seconds. Bearings are taken by the compass stations and sent to him by the control station. Full details may be obtained from the weekly Hydrographic Office bulletin.

The conclusion to be drawn is that the radio compass is destined to play an important part in maritime life in the future.

There are still problems to be solved and difficulties to be overcome before it attains its full measure of usefulness. On the other hand, there is no doubt that it is purely a question of development. Even at the present time the radio compass affords the mariner something that he never had before, and many ship captains have gratefully acknowledged benefit from its use. (A gratifying feature of this service is the good will which will be engendered between the navy and the merchant marine because of it). The device is not yet perfect nor fool proof, and the writer would be the last to counsel navigators to discard all ordinary precautions and rely solely on radio compass bearings for their positions. The perfection for which we all hope will come gradually through the earnest cooperation of all concerned in the elimination of defects of personnel and matériel, and as before hinted in this article the radio compass is a forward looking development. We may yet see it an active competitor of the magnetic compass.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

A RATIONAL AMENDMENT TO PRESENT METHODS OF PROMOTION AND ELIMINATION

By COMMANDER J. O. FISHER, U. S. Navy

Motto: The principal spring from which the actions of men take their rise, the rule they conduct by, and the end to which they direct them, seems to be credit and reputation, and that which at any rate they avoid, is in the greater part shame and disgrace.—JOHN LOCKE.

Promotion should be the reward of credit and reputation in the naval service, and as these rewards are distributed, the actions of naval officers are affected. Nothing is more important than a method of promotion which shall reward the deserving, eliminate the unfit and provide leaders of experience for positions of authority and responsibility. All will agree that that, at least, is the desired result. Its attainment is difficult, and its non-attainment will probably be evident first.

Dissatisfaction in the service as evidenced by resignations and other less apparent signs, may be due to many and obscure causes. At the present time there is undoubtedly dissatisfaction and uncertainty as regards the method of promotion. No more evidence is needed that such dissatisfaction, from such a cause, exists in the minds of competent authority than the effort to improve the present method of promotion, *i. e.*, selection, by (G. O. 494) requesting the selection of those best fitted for promotion, by all the senior grades from the candidates for promotion.

This attempt at improvement of the method of selection, called facetiously "promotion by acquaintance," has brought home to many officers for the first time the difficulties which are encountered by each member of the selection board, and will make some officers more tolerant, and others more doubtful of promotion by selection and its effect on the naval service.

Believing with John Locke that "a thinking and considerate man cannot believe anything with a firmer assent than is due

to the evidence and validity of those reasons on which it is founded," I do not conceive a rational method of promotion which shall obtain and deserve the approval of naval officers as an impossibility.

During the last 20 years, various methods of promotion have been tried. All have been changed but the last, and a modification of that is probable. All have operated for appreciable intervals of time; and during that time sufficient influence has arisen to change them. Ask any officer of experience, however, his opinion of them and you will find that all had their good and bad features.

An analysis of the different methods used in the past should expose the evidence and the validity of the reasons on which criticism of them was based, and such an analysis should at least point the way for avoiding a repetition of previous errors. For instance, officers of the same rank and pay are given different duty, in one case duty of the highest responsibility and authority ordinarily performed by officers considerably senior in rank and experience, while another officer of the same rank and pay is continued in a subordinate position. Frequently officers are promoted in rank and pay with no change in duty. Sometimes with the assignment to duty, an increase in rank, pay, authority and responsibility are included, as in the case of bureau chiefs and commanders-in-chief.

Therefore, in beginning our analysis we have rewards to naval officers for effort and experience subdivided into three classes as follows:

1. Rewards in assignment to duty;
2. Promotion in rank, pay and duty assigned;
3. Promotion in rank and pay.

REWARDS IN ASSIGNMENT TO DUTY

This method of rewards has always been and, judging from past experience, always will be practiced. To eliminate it means that those in authority will be deprived of the very essential right of selecting their subordinates. Nothing is more true than that "results are only accomplished by means of men," not any man, but by men working together for a certain specific purpose. To force the man responsible for the result to use men, who in his opinion, are not qualified, is to delay the result. Sometimes

the particular man desired is not available and it becomes necessary to select the most desirable from those available. But that can hardly be accepted as establishing the principle that the man available is the desirable man. To assume that all officers, even of the same rank, are fitted by personality, experience, knowledge and desire, to perform the same duty is as absurd as to assume that all propellers are interchangeable.

The selection for particular duty works hardship on no other officer. The duty itself carries its own reward. To justify another's faith will call for the greatest effort on the part of the officer selected and his only reward is in the experience gained and in justifying the trust reposed by the selection.

As rewards these intangible evidences of reputation are highly prized by officers in any grade. They fix the service reputation of officers along particular lines. They continue only for a limited time, when the same duty and experience is available for others. They do not necessarily demonstrate an officer's qualifications for increased rank but only for a particular duty. They furnish recognition for especially meritorious officers and an opportunity for experience to ambitious officers. They are attractive only to the officer whose ambition is based on a desire to excel in, and not to enjoy the results of, accomplishment. They cause no dissatisfaction; they create no discontent, they do no injustice. They do, nevertheless, test the qualifications, provide valuable experience, and establish the reputation of especially meritorious officers.

The advantages to the naval service and individuals of rewards by assignment to duty, are many. The disadvantages are limited to isolated cases of jealousy and personal pique of the individual.

PROMOTION IN RANK, PAY AND DUTY

This method of rewards is limited in the navy to a particular class of appointments, very few in number, consisting only of the bureau chiefs and the important commands afloat. Under our system of government, the navy is administered by the President as commander-in-chief, represented by the Secretary of the Navy under such laws as are imposed by Congress.

The Secretary of the Navy is the official administrative head, and being responsible, he selects personally the individuals administering the different departments of the navy under his con-

trol. This administration involves duties and responsibilities of the first magnitude and officers, selected by the Secretary, nominated by the President and approved by the Senate, should have, during their tour of duty and responsibility, rewards in increased pay and rank.

Bureau chiefs are appointed only for four years and the important commands afloat are assigned only during the pleasure of the President. Therefore, rewards by promotion in rank, pay and duty is limited and of a temporary nature. It gives no officer permanent rank and pay in excess of that enjoyed by officers of similar experience. It works injustice to none and it provides the Secretary with responsible aids in carrying out the administration's policies during his tour of office.

PROMOTION IN RANK AND PAY

This method of reward is one which is permanent as compared with rewards in assignment to duty, and rewards by promotion in rank, pay and duty of a temporary nature. For this reason, more than any other, promotions in rank and pay are considered as vital to the naval service; and, due to this intimate relation between these promotions and the service welfare they are, with few exceptions, made only on the recommendation of naval officers, as opposed to other forms of promotion made as a result of politics or personal considerations.

Among the methods of promotion which have been used since the organization of the Navy Department has been: First, promotion by seniority; second, promotion by forced retirement; and, third, promotion by selection.

PROMOTION BY SENIORITY

In this method of promotion every officer had a date of precedence fixed on his entry into the service or graduation from the Naval Academy and all officers took rank and promotion in succession.

In fixing the date of precedence for officers graduated from the Naval Academy the class standing at Annapolis was the basis. If there were 60 graduates in one class, that man who stood first in his studies, stood *one* all the rest of his life in the navy. In large classes, the advantages which accrued to the individual

from class standing continued all through life, due solely to the fact that an officer entering the Naval Academy after two or three years in college was quicker in his studies, a large part of the course being review work for him. Nothing that any officer could do under this system of promotion would ever remove the disadvantages of low class standing as regards promotion. Promotion of itself was very slow and after the officers attained the higher grades there were frequently years which intervened between the promotion of the man who stood at the head of his class and the man who stood at the foot. At best, the reward as evidenced by future promotion during the entire service of the officer was based, not on his service reputation, but upon his class standing at Annapolis; upon what he had done at the Naval Academy, and not upon what he did after getting out into the service; upon his acquisition of a naval education, not upon the use he made of it.

As a brief perusal of past naval registers will evidence, when this system of promotion was followed there were alternate periods of rapid and slow promotion for the simple reason that every class, being of approximately the same age, will retire for age at about the same time. While all of a class can be included in one of the lower grades, to include all of one class, among the few admirals allowed, means that in the future the man who stood *one* in the class can be the senior admiral while the man who stood at the foot of the class can be some distance down on the captains' list, with the result that with retirement for age all of a class would retire within a period of a few years.

The service in the different grades was not properly proportioned and an officer would spend 25 years in attaining the rank of lieutenant commander, and 12 years from his commission as lieutenant commander until he became commander-in-chief. This resulted in officers of his particular class getting too much experience in the lower grades where attention to detail was of importance, and not enough experience in the higher grades where responsibility and attention to the larger problems was of importance.

There was at least uniformity under this method of promotion and it was seldom that an officer came up for promotion who was not, upon examination, found competent for the next higher grade, unless he had a particularly bad record.

Upon promotion by seniority an officer, when under examination for the next higher grade had to be promoted or dropped from the naval service. Under the law an officer could be held up one year, at the end of which time if he was not promoted he must be dropped, there being no provision in law for continuing him in a grade, at his own request, in which he had been performing his duty satisfactorily. Naturally when an officer came up for promotion after 15 to 30 years service, officers in the service were not going to have him dropped except for some good reason. They did not consider, and I doubt if any fair-minded man would consider, that because a man was not qualified to be a captain he should not continue in the grade of commander where he had been doing the duty required. To require that a man be punished, not for failure to do his duty, but for lack of ability, worked hardship and injustice and, needless to say, very few officers were ever dropped for failure to pass examination except in cases where their records demonstrated a neglect of duty and moral disqualification for which they should, with justice, suffer being dropped from the naval service.

Retirements were made only at 62 years of age or after 30 or 40 years service, with the result that retired officers as forming a nucleus for expansion in time of war did not exist.

When appearing for examination under this method of promotion an officer's record was examined, but most officers had good records. A bad record was an exception, and this condition has continued, I believe, to the present time.

This condition is well summed up by the remark by a member of the selection board that "the records showed one-half the officers to be above the average and the other half to be average officers."

PROMOTION BY FORCED RETIREMENT

In this method, in order to remedy some of the evils of the system of promotion by seniority and particularly to obtain officers in the upper grades of more experience in these grades and to give a regular flow of promotion, a system of forced retirement was adopted, a number of officers being selected by a board each year and retired by the President upon recommendation of the Secretary of the Navy. To compensate for this forced retirement, a provision was included which provided for their

promotion to the next higher grade on the retired list but this provision was later revoked and officers were retired in the grade which they held.

At first, this "plucking board" operated with what might be called the universal approval of the service, but after a few years those officers whose reputation was such that their forced retirement was universally approved had decreased in numbers to such an extent that these selections became more and more difficult to make and eventually the dissatisfaction with these selections for retirement became so great that this plucking board, or promotion by forced retirement, was abolished.

The plucking board was handicapped by having to use the same records that were available under promotion by seniority and the difficulties caused by these reports were one of the primary reasons for dissatisfaction, with the result that officers who had been plucked claimed and demonstrated when requesting legislation to restore them to the naval service, *that their records were not only good, but exceptionally good, in that they had letters of commendation and various other evidences of splendid service experience.*

This method of promotion also included a provision by which officers who had had 20 years service could retire on request and approval by the Secretary of the Navy. This was one of the amendments to the original act and was inaugurated with the same desire to provide younger officers in the higher grades. This was found in operation to have permitted the retirement of a number of comparatively young men and desirable officers on three-quarters of the pay of their grade when the cry was continually for more officers.

Eventually, forced and voluntary retirement were abolished and the selection board came in.

PROMOTION BY SELECTION

This is the method under which promotions are made at the present time and with which dissatisfaction and criticism is increasing. Its object is to select the most desirable officers for promotion, and strange to say the only provision made for elimination is by court-martial and dismissal, by being dropped as a result of failure to pass examination and retirement for age in grade.

The selections are made by a board of nine rear admirals who go over the records of all officers, and six votes are required for the promotion of any officer.

In promotion by selection, we find many cases where one board of nine rear admirals pass over officers as not being qualified for selection and a succeeding board recommends those officers for promotion. The result is that officers are first seniors and then juniors to their brother officers. This also demonstrates more conclusively than ever that opinion and acquaintanceship are considerable factors in selection and that the records on which the selection is based are not accurate and correct enough for the same decision to be reached by different boards in all cases. To assume that an officer of from 10 to 30 years service can, during the interval, *i. e.*, about six months, between meetings of the selection board, remedy his deficiencies is absurd. He can correct his record, not transform himself.

In the same grade, officers do varied duties: some performing important duty of one kind and some important duty of an entirely different kind; some in subordinate positions on large ships and some as commanding officers; some ashore, some afloat; some having tc do with material and some dealing only with personnel; and I doubt very much that any officer in any grade is expert in all these activities, and for that reason not only does the selection board have to pass on the individual records, but they have to pass on the relative value to the naval service of the performance of various duties by the officer.

Officers who have been passed over must remain in that grade. They can resign, it is true, but an officer after having 15 to 25 years service in the navy is seldom qualified for a position in civil life. If he stays in the service he receives orders from his previous juniors, and if he gets out of the service he faces a long period of privation before he can establish himself in some new work, and the chances are that the officer has a family upon which this injustice works greater hardship than it should.

In civil life the officer would probably have been drawing equivalent pay, his expenses would have been less, he would probably be permanently located and own his own home so that in case he was treated unjustly by his employer he could leave or resign and go with some other employer in a similar line of work. In other words, the naval officer is denied the right by force of

circumstance, rather than by law, of vacating a position where his juniors are promoted ahead of him and in which he considers he has been treated unjustly. To expect anything but dissatisfaction and discontent under those conditions is to put naval officers in a different class from all other human beings.

It is doubtful if any method of promotion can work to the benefit of the naval service which does not provide for the elimination, voluntary or forced, of discontented individuals who have been refused promotion.

GENERAL DISCUSSION

The navy has in the past few years expanded enormously and where 20 years ago the senior officers in the service knew all the other officers, at the present time it is doubtful if any of the senior officers know more than a very few of the lieutenants and below, and few of the lieutenant commanders. This requires that more and more, the method of promotion, must be based on the written record and not upon the personal knowledge of the board. To expect any officer to add up a column of figures not knowing what the figures are, or to suggest an improvement in a piece of machinery not knowing what the piece of machinery is, or to select officers for promotion having only the opinions of other seniors, unknown to him, is expecting not human but divine qualifications. Unless an officer's record can be made a record of fact, such that any board of officers, unacquainted with the reporting senior or the officer reported on, will reach the same conclusion as to his abilities, is to blindfold and gag any board under any method of promotion.

One of the great difficulties lies in the method of marking officers' records, in that there is no standard on which the marks are based. For instance, one rear admiral emphasizes the importance of gunnery and a good gunnery record, or a good mark in gunnery is a criterion of the officer's value to the service in spite of the fact that this officer may have failed badly as an engineer officer. Another officer performing duties as navigator gets a very high mark as navigator but may have had no duty as gunnery or engineer officer. He still has high marks, however, in his grade. Still another officer may have spent his time and experience, while these officers were serving as engineer and gunnery officers of first-class ships, as commanding officer

of a submarine or destroyer. He receives a mark as a naval officer as they all do, but who is to integrate the relative value of a mark as a commanding officer with a mark as navigator, with a mark as engineer officer, with a mark as gunnery officer.

Again, the reporting senior may have just had one of the finest officers in the service who is succeeded by an average officer in some particular position and as a result the average officer is given a low mark; or, vice versa, a senior has had a very poor officer in some position who is relieved by an average officer. Under these circumstances will it not be reasonable for the reporting senior, being only human, to give the average officer succeeding the officer of superior qualifications too low a mark and the average officer succeeding a poor officer too high a mark? That this occurs is only too evident to any officer who will examine his own record. In other words, the conditions under which an officer is performing duty affects the marks which he will receive, and no better advice can be given a young officer at this time than to select those with whom he will work and be compared, or those whom he relieves. This condition is due primarily to the lack of standards.

What officer can write a specification for a standard mark in any duty, which an officer can perform and which being given to several senior officers reporting on their junior, would enable them to give the junior the same mark for the same performance of duty?

In the first place, the officer writing out the specifications for the standard would himself be handicapped due to the fact that his own experience has been limited. He may have had much experience in larger ships and know nothing of the duties in destroyers and submarines. He may have had no duty ashore where this officer is performing duty at the present time, and at the best his standard would only be very general.

The more thought given to the question of standard marks, the more firmly will one become convinced that standard marks are a very difficult and impossible creation. Their substitute and their only substitute is a method of comparison. By this I mean that any reporting senior must compare the accomplishments of the officer reported on with other officers whose performance of duty is familiar to him.

Provided he is unfamiliar with the performance of other officers in that particular line of duty, it is a self-evident fact that the reporting senior is not competent to give a mark.

Provided he is familiar with the performance of other officers, he is capable of comparing the performance of this particular officer with those other officers, and deciding in his own mind as to which of the officers are best qualified and which are less qualified for this particular duty. Therefore, a method of comparison should be substituted for marks, the comparison to consist of comparison with other officers performing the same kind of duty, and that these comparisons should list officers in three classes: "above the average," the "average" and "below the average." Each senior reporting on a junior should be required to first, place this officer in one of these three classes and some other officer in each of the other two classes, and having done so to list other officers of the same rank in the same class, or in different classes; for instance, assume officer "A" performing engineering duty is being reported upon by his senior. His senior places officer "A" in the average class. He is acquainted with the performance of engineering duty, however, of officers "B" "C," "D," "E," "F," "G" and "H" of the same rank. He considers officer "F" to be above the average, officer "E" to be below the average and officers "B," "C," "D," "G" and "H" to be the average officers in performing this same kind of duty.

In this manner the reporting senior not only expresses his opinion of his subordinate's abilities, but he also gives the information on which this opinion is based by citing the names of officers with whom the officer reported on, has been compared.

In this method of comparison as outlined above, its application is limited to comparing officers in the performance of similar duty. In its use it is not contemplated that an officer performing engineering duty should be compared with an officer performing gunnery duty, or with an officer doing duty as commanding officer, but only with officers of the same rank performing similar duty.

In making out reports of comparison the determining factor is information regarding an officer's qualifications for a particular duty. In performing that duty, he comes in official contact with many officers, staff and line, all of whom work with and through

him in performing their duty. The result of their observations should be of value in all cases. Cooperation is required, and certain phases of an officer's character and efficiency are equally exposed to all his seniors, some particular phases more readily to the medical and supply officers and to the chaplain than to the ordnance, engineer, or executive officers. Too much information is impossible. All senior officers, of rank not less than lieutenant commander and two grades senior to the officer reported on, should be required to submit reports of comparison.

After a comparison has been made with other officers of the same rank doing similar duty as outlined above, the next step is to compare that officer's services to the navy with the services of other officers of the same rank of slightly differing experience as deserving promotion. Is it desirable that this officer be promoted in order that he may be retained in the service, or is he poorly qualified for promotion and should he be permitted to leave the service?

It is manifest that under a method of promotion by seniority, as outlined previously, that we have alternate periods of rapid and slow promotion and that a remedy for this condition is to promote only a decreasing number of any class to the higher grades. For instance, by the Act of Congress of August 29, 1916, it is provided that "the total number of commisioned line officers on the active list . . . shall be distributed in the proportion of one of the grade of rear admiral to four in the grade of captain, to seven in the grade of commander, to fourteen in the grade of lieutenant commander, to thirty-two and one-half in the grade of lieutenant, to forty-one and one-half in the grades of lieutenant junior grade and ensign, inclusive." These relative proportions are fixed and provided we assume a class of 42 members as ensigns and lieutenants, junior grade, only 32 can be promoted to lieutenant, only 14 to lieutenant commander, seven to commander, four to captain and one to rear admiral, if we expect a uniform rate of promotion to take place. All officers of the same year of commission as ensigns cannot become rear admirals. It becomes mandatory that certain officers be eliminated in each promotion. With a definite ratio between the numbers of officers in any one grade established by law, out of every 42 ensigns and lieutenants, junior grade, only 32 should be promoted to lieuteenant, and out

of every 32 lieutenants only 14 should become lieutenant commanders, and out of every 14 lieutenant commanders only seven should become commanders, and out of every seven commanders only four should become captains, and out of every four captains only one should become rear admiral. It is therefore desirable, for comparison for promotion, that when a reporting senior reports on the value to the naval service of a junior, that those recommended for promotion to any grade should be to the total number compared as the total number in the higher grade is to the total number in the present grade. That is, any reporting senior reporting on a junior holding the rank of lieutenant commander (by this Act of August 29, 1916, of every 14 lieutenant commanders, only seven can be promoted to commanders), it is mandatory that the reporting senior shall recommend only half the number of lieutenant commanders whose services have been compared, for promotion, and the other half for elimination as being the least desirable for promotion.

Without elimination the structure becomes unstable. With a class of 500 at Annapolis, provided no elimination was made except by death, resignation or dismissal, the prospect would be that while the senior man in the class was a senior officer in the naval service, the junior man in the class might be a commander.

In making this elimination, it is desirable that the experience and the services of the officer who, although not recommended for promotion to the higher grade, has had valuable experience in his present grade, should be available in time of war.

Elimination being necessary, a survey of the methods that have been used discloses that the present discussion has covered the case of the plucking board and that this method eventually received the disapproval of Congress and was eliminated by legislative action. Prior to this time, and some years ago, the process of elimination took place at the completion of two years' cruise as passed midshipman and prior to commission as an ensign. It was required due to the fact that sufficient vacancies did not exist to commission graduates of Annapolis, and after six years' striving, those not commissioned were given an honorable discharge and a bounty of $1000. Many of these graduates who were thus eliminated, have become some of the most prominent engineers and industrial leaders in the United

States, and in my rather brief experience I have never heard this method of elimination criticized.

Elimination under all methods has been forced, the individual preference of the officers not being considered. The objection to elimination rests on the fact that a certain amount of time is required for training in civilian pursuits after a considerable time has been spent in qualifying for duty as an officer in the navy. It is suggested that if elimination by request was permitted under certain conditions which would enable an officer to get started in civilian pursuits, that the elimination which is mandatory to secure a uniform rate of promotion could be provided without dissatisfaction. It is, therefore, proposed that any officer after completing eight years' service may apply for transfer to the Naval Reserve Force, upon such transfer to be granted one month's leave with full pay for each year's service, provided he agrees to serve in the Fleet Naval Reserve for a period of five years in the grade which he held at the time of such transfer. The leave and pay would enable the officer to take up some civilian pursuit and establish himself therein without unnecessary hardship on himself or his family. It provides a reserve of trained officers in the Fleet Naval Reserve which will be an invaluable asset in war. It permits elimination without the shame and disgrace attached to the summary findings of the plucking board and, if permitted on an officer's application, it should eliminate one of the causes of discontent which is evident on an officer's not being promoted, the plea being that he must stay in the service because he is not trained for a civilian pursuit.

This proposal above is not a radical departure from present practice, provided it is admitted that an officer is entitled to the same privileges and bonus which are authorized to the enlisted man. Upon re-enlistment under continuous service conditions all men get a bonus of one month's pay for each year of enlistment. The pay of a bonus at enlistment does not differ materially from the proposal to pay a similar bonus upon completion of service.

In the case of the enlisted men the bonus is paid to encourage continuous service. In the case of officers the bonus should be paid to encourage service under conditions where only limited promotion to the higher grades is possible under the present law fixing the proportions in the different grades.

CONCLUSION

From the above analysis, it is considered demonstrated that a primary cause of unsatisfactory results with any method of selection for promotion or elimination rests on methods of giving marks in efficiency, based on a vague and indefinite standard in the present reports of fitness of officers. A secondary cause exists in the fact that an officer when not promoted, as a result of selections for promotion or elimination, is given no opportunity to change his occupation except under conditions which involve more or less hardship on the officer and his family. Frequently, after many years of satisfactory service, he is compelled by force of circumstances to endure the chargin of being passed over by other officers, until he reaches an age which provides for age in grade retirement.

To remedy this condition, it is recommended that the officers' records be revised and a method of comparison be substituted for the method of marks, as a measure of efficiency. The comparisons to be based on:

(a) The performance of the particular duty engaged in.

(b) Recommendations for, or against, promotion.

Reports of fitness shall be made by all officers two grades senior or more to the officer reported on, but only after at least three months' observation of his manner of performing duty. Each report shall include comparison of methods of performing duty and comparison as regards recommendation for promotion as outlined above. Each report shall contain a specific outline in detail of the particular duties performed, such general titles as "Executive," "Gunnery," "Watch Officer," etc., being prohibited.

The comparison, under (a) above, shall include comparison with at least five other officers of the same rank who have performed similar duty, and at least one of the officers of those listed for comparison to be above the average, one the average and one below the average.

The comparisons, under (b) above, shall be separated into two classes only, those recommended for promotion and those not recommended for promotion, the total number compared not being less than 10 and those recommended for promotion to be that percentage of the whole number compared, which the authorized strength in the next higher grade in the navy bears to the authorized strength in the present grade of the officer reported on.

It will be recognized that the above recommendation can be carried out as a matter of administrative routine only, no Congressional action being necessary.

The following recommendation calls for Congressional action to give officers the same privileges and bonuses provided for enlisted men for the same purpose of encouraging active service and providing an adequate reserve of trained personnel:

That, in addition to the present methods of elimination, any officer in the navy who has completed eight years' service shall be transferred to the Fleet Naval Reserve at his own request, under the same conditions such transfer is made for enlisted men, with the following additional conditions:

(a) Upon approval of his request for such transfer, the officer shall be granted one month's leave with full pay for each year of service, at the end of which time he shall be transferred to the Fleet Naval Reserve with his present rank.

(b) He agrees to serve in the Fleet Naval Reserve for five years unless sooner discharged.

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BORESIGHTING SUBMARINE TORPEDO TUBES

By Lieut. Commander Donald Royce,
Construction Corps, U. S. Navy

The boresighting of artillery is generally well known and practised by military people; in fact, the theory and practise of this process are injected fairly thoroughly into the midshipmen at the Naval Academy. But although submarine torpedo tubes have been boresighted for some years, very little is generally known about the subject, and it is believed that the methods used vary somewhat. Above water torpedo tubes can be boresighted in the same manner as the artillery, but the submerged tubes require special methods, and in the submarine, where the torpedo is the major weapon, this problem is of primary importance.

In general, the bow torpedo tubes are designed to be parallel to the center-line of the submarine; the torpedoes when fired leave the submarine on its heading at that time, and run on that course toward the target. The periscope, turned so as to be looking dead ahead, should point in the same direction as the torpedo tubes. The object of the boresighting process is to ensure that the tubes and periscopes are properly aligned; *i. e.*, when the periscope azimuth circle reads zero degrees, the line of sight through the periscope is parallel to the mean axis of the tubes. The importance of such correct alignment, or information as to the amount of mis-alignment, can be demonstrated by comparing the effect of such an error with the size of possible target.

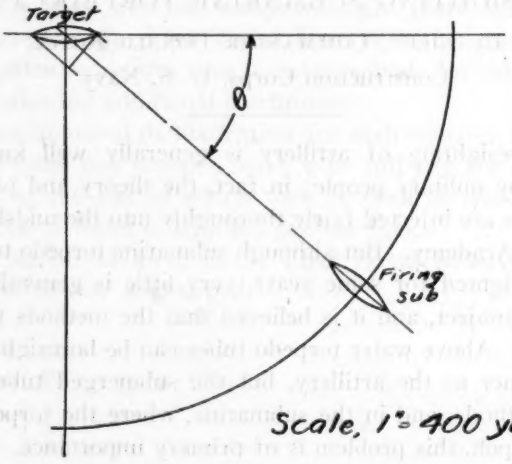
During the World War, the only possible targets for our submarines on patrol were enemy submarines; the possibility of a recurrence of similar conditions in future warfare is considerable; moreover, the same error will be made in firing at longer ships,

although its magnitude compared with the size of target will not be so impressive.

Target = 200′ length
= 20′ beam } Average size of German "sub."

θ = ∠ of target from astern or ahead position.

Aspect of length normal to line of fire at any position of firing "sub" = $l \sin \theta = 200' \sin \theta$. But at astern position and a few



degrees therefrom, the beam exceeds $l \sin \theta$, and up to the point where $l \sin \theta$ = beam, it will be assumed that the average aspect of target = beam = 20′. This ∠ includes up to 5° 45′, for then 200 sin θ = 20′. Beyond that point, width of target normal to line of fire equals $l \sin \theta$, and the average target equals the length times the average value of sin θ.

$$\text{Average value } \sin\theta \Big]_{5°45'}^{90°} = .675$$

$$(200)' \; .675 = 135'.$$

To find average aspect over entire quadrant:

Arc	Target	Product
5° 45′	(20′) =	115
84° 15′	(135′) =	11373
90°		11488

$$\textit{Average aspect} = \frac{11488}{90} = 128.' = 43 \text{ yards.}$$

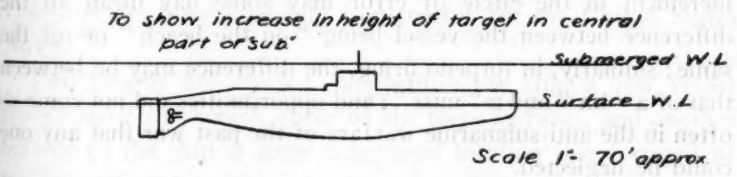
The result will be the same in the other three quadrants, and this distance represents the average width of the target going around the whole circle.

Now, if submarine torpedo tubes were so aligned as to include an error of $x°$, *i. e.*, when the commanding officer was "dead on" by his periscope and fired, and his tube pointed $x°$ away from where he figured, he would miss by an amount equal to $R \tan x°$, R being the range.

Some possible results are:

	$x=1°$	$x=2°$	$x=5°$
$R=1000$ yards	17.4 yards	34.8 yards	86.9 yards
$=2000$ yards	34.8 yards	69.7 yards	174.0 yards
$=5000$ yards	87.0 yards	174.0 yards	435.0 yards

These results clearly indicate the necessity of detecting any existing error; the amount of error that could creep in without being detected in the ordinary course of inspection is problematical, but it is felt that it could easily be as much as 1° as a result of cumulative errors in the periscope and tube installations without attracting notice. In practise, such an error has not yet been exposed, but if such should creep in and remain undetected, which it would if the tubes were not boresighted, then the chance of getting a hit at 1000 yards would be lessened considerably, and at 2000 yards would be remote. The argument applies even more forcibly than the foregoing demonstration indicates, for in regard to the other dimension (depth of the target), that central portion of the target "sub" including the conning-tower, shears, bridge structure and periscopes, where the depth of structure is the greatest, is certainly the most advantageous, for there a miss due to faulty depth setting or control is the least possible.



Average depth of target over whole length = 18.'5 feet.

Average depth of target for 20 feet length near midship section = 30 feet.

This shows advantage of doing everything possible to restrict "run" to central portion.

If target submarine is on surface, argument is not so apparent, but as torpedoes are more given to erratic runs with low depth settings, any small gain in depth of target should be taken advantage of.

Average depth over length = 11 feet.

Average depth for 20 feet length near midship section = 14.5 feet.

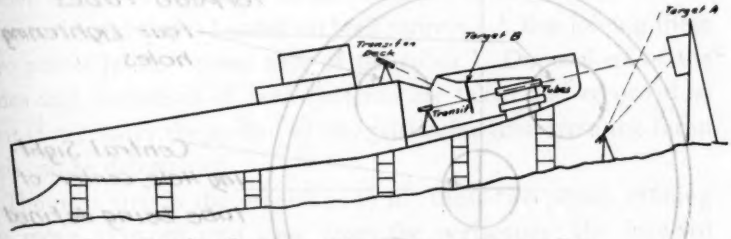
In surface vessels, the rise in keel forward and aft will not be so great, and the gain in limitation of target to central portion will be quite small.

For larger ships, as battleships, cruisers and destroyers, the effective target will be much longer and its depth will be more nearly uniform, but, on the other hand, the possibility of getting in close for a shot is less; there will be more eyes on watch, searching from higher platforms, equipped with better glasses, and moreover, the vessel will be armed with a powerful anti-submarine battery. The argument will apply with nearly equal force, that the error of installation may be sufficient, all other factors being perfect, to cause a complete miss.

Possible errors due to failure to hold the vessel steady on her heading, to errors in judging the enemy's course and speed, to erratic running of the torpedo, may be much larger than the error of installation; but it is worth while to reduce the circle of error to a minimum; as in navigation, although the errors due to personality in taking the sight may be larger than the seconds of arc retained in the calculations, it is advisable to keep the possible error down even to the extent of somewhat greater labor; any increment in the circle of error may some day mean all the difference between the vessel being "on the beach" or off the same; similarly, in torpedo firing, the difference may be between that of a "hit" and a "miss"; and opportunities did not come so often in the anti-submarine warfare of the past war that any one could be neglected.

Boresighting of submarine torpedo tubes could satisfactorily be done in an extremely long dry-dock or on the building ways at a range equal to the mean probable range; what this range is

will be problematical at best, and will vary with the type of warfare to be waged; furthermore, such a method is confronted by practical obstacles; long dry-docks are not so numerous that one or two "subs" can have the whole dock; submarines on the building ways have an inclination of about $\frac{3}{8}$ inch per foot, about 2°, and if boresighting was to be done at 2000 yards, the target would be 190 feet up in the air, and then only would be visible provided there were a clear line of sight through the shipyard from the torpedo tubes to the target. The solution offered overcomes these difficulties and is good for any range; once done, the alignment of the tubes is known, and the setting of the periscopes can be checked at any time.

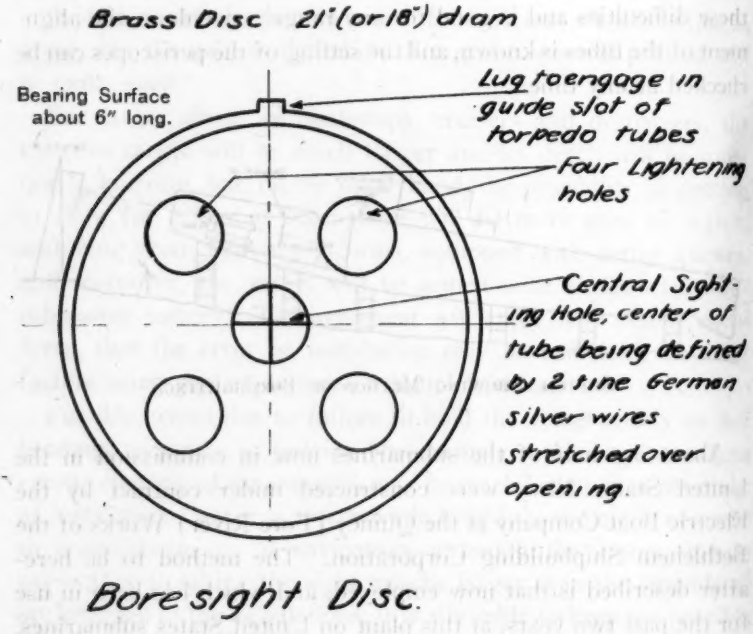


SKETCH SHOWING METHOD OF BORESIGHTING.

About one-half of the submarines now in commission in the United States Navy were constructed under contract by the Electric Boat Company at the Quincy (Fore River) Works of the Bethlehem Shipbuilding Corporation. The method to be hereafter described is that now employed, and which has been in use for the past two years, at this plant on United States submarines. The work is done by the company's engineers under the supervision of the Superintending Constructor for the United States Navy.

Two targets are erected, one within the ship a few frame spaces abaft the breech doors of the torpedo tubes, and another outside of the ship at some convenient location just forward of the bow; these targets are designated as Target A (outside) and Target B (inside). In the following explanation it will be assumed that the vessel is upright, and no correction will be made for the

list of the vessel. The two targets are erected in parallel planes perpendicular to the axis of the submarine, *i. e.*, parallel to the plane of the frame of the vessel; in fact, the inside target may be secured tight to the frame bar, which makes a very favorable place to secure to. Interlocks are provided on the doors of the torpedo tubes, so that in the ordinary course of operation such a contingency as having both breech and muzzle doors open at the same time is supposedly prevented; this interlock is mechanical and

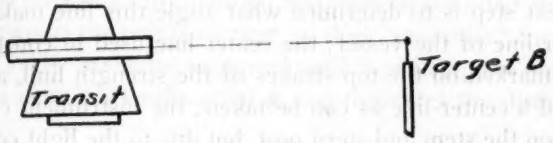

Brass Disc 21"(or 18") diam
Bearing Surface about 6" long.
Lug to engage in guide slot of torpedo tubes
Four Lightening holes
Central Sighting Hole, center of tube being defined by 2 fine German silver wires stretched over opening.

Boresight Disc.

easily tripped, so that for this purpose both doors can be opened at the same time. Two boresight discs are now fitted in the tubes, one in the breech and one in the muzzle; these discs are as shown in the above sketch.

The instrument man now sets his transit on the line passing through the centers of the boresight discs; the point where this line meets the outside target is marked, and that on the inside target is also obtained, this being done in a somewhat unique manner; the line of sight passes about a half inch above a batten

in Target B; a small brad is driven in this batten and forced down until the top of the head is just even with the line of sight, thus:

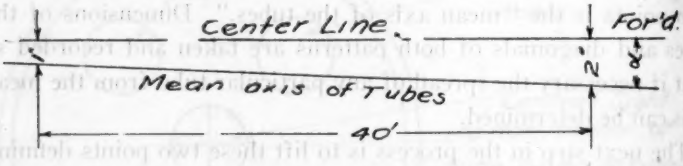


Spots are obtained in the forgoing manner for all four tubes; lines connecting these four points form a rectangular pattern on each target. The two patterns should be similar in shape and size, and any irregularity is an indication of faulty installation. The mean center of the four tubes is taken as the intersection of diagonals, and this is located on both targets. A line joining these two points is the "mean axis of the tubes." Dimensions of the sides and diagonials of both patterns are taken and recorded so that if necessary the spread of any particular tube from the mean axis can be determined.

The next step in the process is to lift these two points defining the mean axis out into view from the periscopes; the forward point is first lifted by means of a plumb, or with the instrument, vertically up about ten feet. The transit is now brought up on deck and set up so that its axis is horizontal, and that by rotating the instrument about a transverse axis, the line of sight will at successive times pick up the mean point on the inside target (sighting through the torpedo loading hatch) and the raised point from the outside target; this vertical plane which the instrument swings in is that containing the mean axis of the tubes. The instrument is now pointed, first at the stem, then at a point on deck just over a superstructure bulkhead, then at the torpedo-room escape hatch and then at the torpedo-loading hatch; the four points are punch-marked and form a fairly permanent definition of the "mean axis of the torpedo tubes" lifted and laid down on the superstructure deck; two points would really suffice, but it is considered expedient to take four so that if ever there should be a shifting of the structure due to one reason or another, there would be a means of checking up without going

through the tedious process of running the lines all over again. These four marks are subsequently marked by brass identifying plates.

The next step is to determine what angle this line makes with the center-line of the vessel; the center-line used in construction is punch-marked on the top strakes of the strength hull, and this is as good a center-line as can be taken; the instrument could be centered on the stem and stern post, but due to the light construction of these members, and the consequent liability to deformation on erecting, a center-line secured in such a manner would probably not be as good as the one previously mentioned. The angle between the mean axis and the center-line is now obtained by measuring the distances between the two lines at two widely separated points and the angle may be computed.



$$\tan \alpha = \frac{2-1}{(12)(40)} = \frac{1}{480}.$$

$$\alpha = 7 \text{ minutes.}$$

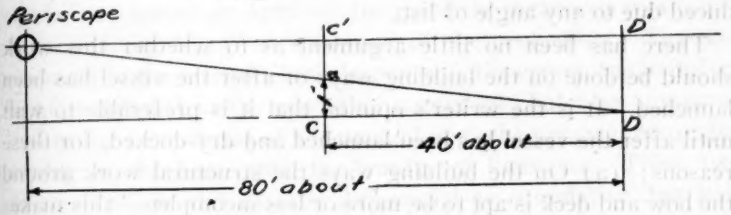
Mean axis of tubes runs 7′ to starboard of center-line.

The next step is to set the periscopes, which can now be done at any time, usually just before the delivery of the vessel to the government; it is of importance that the points established in the foregoing be sufficiently identified; otherwise, all the work is worse than useless. When the periscopes are being set, the record of the boresighting should always be at hand, so that in case of any confusion it can be referred to for guidance.

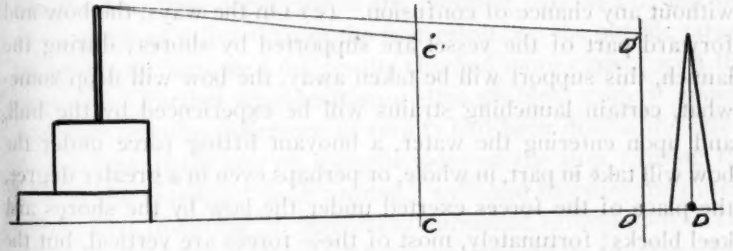
Many periscopes are two-power but it is generally agreed that the low power will be used for firing; the instrument should be in the firing power when it is set. This is important, as there is a very noticeable shift in the cross-hairs when the power is changed; this seems to be a defect recognized and accepted as being more or less inevitable by the manufacturers and inspectors. A few minutes of arc will make but little difference in using the

periscope for searching purposes, but they should be eliminated when firing.

A man is stationed at the periscope, another out on deck and a third on the bridge to communicate between the other two. *C* and *D* are two of the points marked on deck, as on the "mean axis of tubes." The periscope is turned until it picks up the point *D;* the man on deck marks the point *a,* and measures the distance *aC;* a



rough calculation by the man at the periscope in this case shows that the distance between the mean axis and the periscope line of sight when parallel thereto is 2 inches: he instructs the man on deck to mark points *C'* and *D',* 2 inches from the mean axis, and then eases the periscope around until it picks up the points *C'* and *D'*; adjustment should be made until two points equidistant



from *CD* are both seen on the vertical wire of the instrument: the line of sight through the periscope then is parallel to the mean axis of the tubes, and the azimuth circle on the periscope should be set to read zero degrees. The periscope is completely boresighted, and the other periscopes can be set in a similar manner, except in cases where the eyepiece is so high in the air or the field is so restricted that it does not include a view of the deck. In such a case, there are two possibilities: (a) A distant object can be picked out, and this periscope's azimuth circle set

to agree with that of the instrument previously set, when both are centered on the distant object; (b) the points on deck can be lifted by vertical battens or plumb-bobs so as to come within the range of vision. This method is probably preferable for any case as even under the most favorable circumstances, the points on deck are so low down in the field of the periscope as not to be near the intersection of the cross-wires. The distances of C' and D' from the points C and D must be equal, otherwise an error will be introduced due to any angle of list.

There has been no little argument as to whether this work should be done on the building ways or after the vessel has been launched. It is the writer's opinion that it is preferable to wait until after the vessel has been launched and dry-docked, for these reasons: (a) On the building ways the structural work around the bow and deck is apt to be more or less incomplete—this makes difficult the fixing of permanent identification marks and furthermore introduces a problematical deformation upon securing the remainder of the structure. (b) Any confusion as to or obliteration of the marks should be sufficient reason for the repetition of the work. If the work is done in dry-dock, the periscopes will probably be installed, the structural work all complete and the entire job, including the setting of the periscopes, can be done without any chance of confusion. (c) On the ways, the bow and forward part of the vessel are supported by shores; during the launch, this support will be taken away, the bow will drop somewhat, certain launching strains will be experienced by the hull, and upon entering the water, a buoyant lifting force under the bow will take in part, in whole, or perhaps even in a greater degree, the place of the forces exerted under the bow by the shores and keel blocks; fortunately, most of these forces are vertical, but the amount of horizontal deflection that may result could be considerable. The process of docking the vessel will not be such a severe strain; the vessel will be more evenly shored, and in general will more closely resemble the vessel in the water than it does when still on the building ways.

For these reasons, it seems better to do the work in dry-dock when the vessel is completed, but unfortunately during the war it was not found expedient to dry-dock the submarine for this purpose, but it should be policy to check the results in dry-dock

at the first favorable opportunity. Probably the difference found would be quite small. The largest submarine yet built for the United States Navy, No. 52, the *AA-1*, was boresighted on July 19, 1918, on the building ways just prior to launching, and the tubes were found to point 5′ 46″ to starboard of the center-line; later, after the vessel had been launched and had done some running in the open sea, the vessel was dry-docked, the tubes were again boresighted on April 22, 1919, and the mean axis was found to be running 6′ 13″ to starboard of the center-line. The discrepancy in these results includes not only the errors due to deflections mentioned in the preceding paragraph, but also any error due to the inexactness of the method, *i. e.*, the personal error, the setting of the boresights, the tranfer of lines, etc. These two factors may in this case be differential or cumulative, but it is reasonable to assume that neither is of very great magnitude, when their algebraic sum is less than one minute.

The first job of this character was done on submarine No. 67, the *O-6*, at Simpson's Dry-dock in East Boston—it was a hot summer's day; two tube lines were run in the morning and two in the afternoon; the patterns were examined and a serious discrepancy was found in the length of the sides; it was decided to run the two lines completed in the morning over again, and the spots obtained differed from the first results on the outside target by nearly an inch, and the results checked more closely with the expected. Further consideration of this problem made it appear probable that the difference in results had been due to the effect of the heat of the sun on opposite sides of the ship, causing the bow of the vessel to "walk around" sufficient to cause the difference. The Inspector of Machinery furnished information to the effect that similar trouble had been experienced in running shaft lines, and that the general practise of the yard was to run all shaft lines at about 4 a. m. Such a procedure seemed to be necessary in this case, and it was decided to do the boresighting of the tubes on future installation at such a time of night as to allow the vessel to reach an equable temperature and to permit completion of the work before the arrival of the next sun. This means beginning the work about midnight, as a careful instrument man will require nearly four hours for a thorough painstaking job. It is also better to do the work outside of the usual working hours.

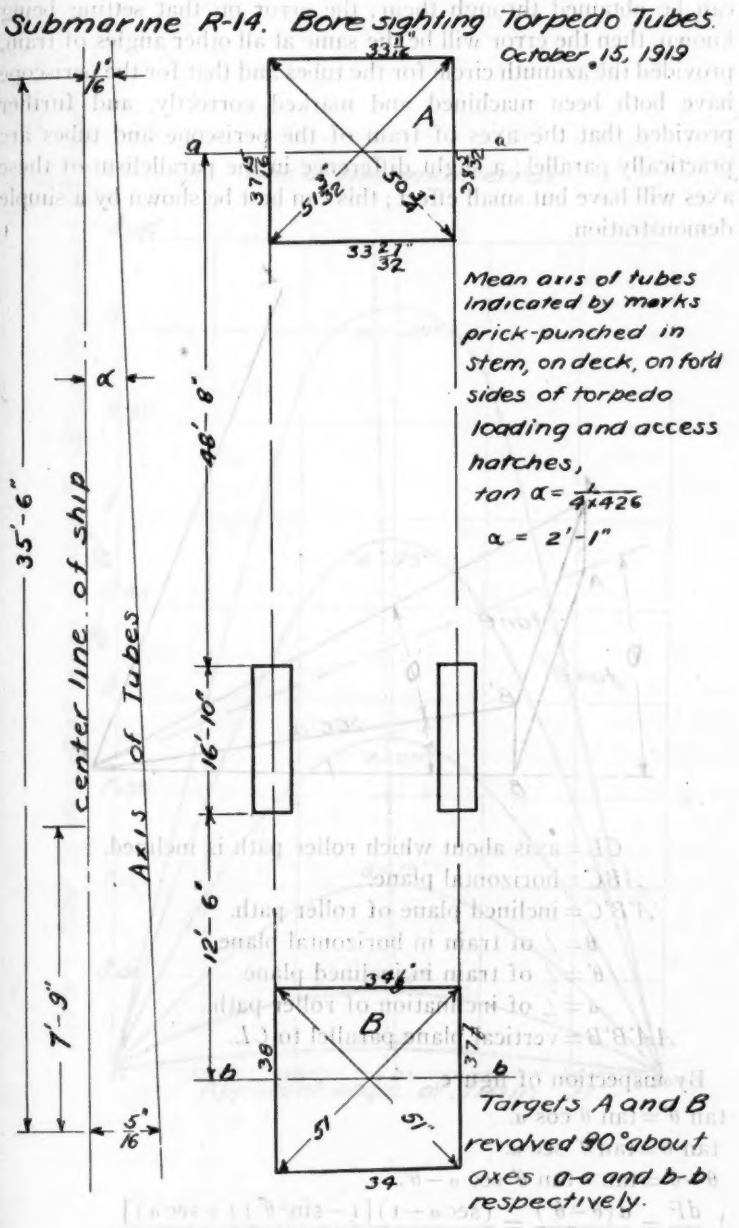
for then there is less chance of someone coming along, stumbling over a target and completely " spilling the beans." On an overcast day the conditions are probably about the same as at night, and it has been found permissible to do this work under such conditions during the daytime.

It was assumed at the beginning of the discussion of the details of the method that the vessel was upright on the building ways; this condition may or may not be true; the amount of list can be determined from square marks on the bulkheads, which are used as reference points in the construction of the vessel. Then, in lifting the mean point on the outside target, and in setting up the transit on deck, the angle of list should be taken into consideration, and the transit inclined at that angle also; this procedure ensures that the line defined on deck is parallel to the " mean axis of the tubes." In lifting the marked points on deck into the field of vision of the periscope, the list may be disregarded if both points are lifted vertically the same amount; the only effect will be a slight shifting of the " mean axis " parallel to itself without a change of direction.

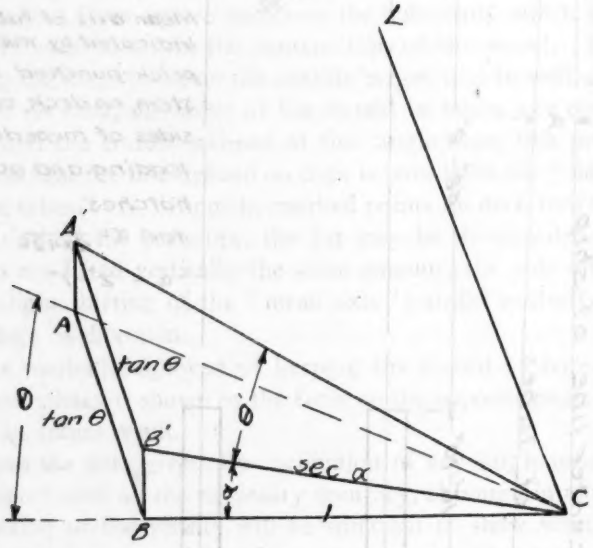
The method employed of keeping the record of boresighting jobs completed is shown by the form on the opposite page, filled in with an actual result.

From the data given, the inclination of any single tube can be calculated with all the necessary accuracy, although in most cases inspection of the results will be sufficient to show whether any tube deviates appreciably from the mean. The net result of 2′ 1″ is slightly better than the average; out of 17 records available, the average inclination of the tubes from the center-line of the submarine is 2′ 27″, the maximum is 8′ 42″ and the minimum is 00′ 15″.

The same method can be applied to stern tubes; broadside tubes, either fitted in the main hull or in the superstructure, will need be treated somewhat differently, the principles involved remaining the same, the application somewhat different. The periscopes can only be set to one group of tubes, which should be the bow tubes, the error on that setting for the other groups can be determined by the boresighting, and, if this error be appreciable, can be allowed for when firing from those tubes. In the case of movable broadside tubes. the tubes can be trained out where a clear view


Submarine R-14. Bore sighting Torpedo Tubes.
October 15, 1919
33 11/16"
A
a
a
37 5/16
35 31/32
51 3/32
50 4/32
33 27/32"
Mean axis of tubes indicated by marks prick-punched in stem, on deck, on fore sides of torpedo loading and access hatches,
tan α = 1/4x426
α = 2'-1"
35'-6"
1/16
α
48'-8"
center line of ship
Axis of Tubes
16'-10"
12'-6"
7'-9"
5/16
34 1/8
B
b
b
38
37 5/8
51
51
34
Targets A and B revolved 90° about axes a-a and b-b respectively.

can be obtained through them; the error on that setting being known, then the error will be the same at all other angles of train, provided the azimuth circle for the tubes and that for the periscope have both been machined and marked correctly, and further provided that the axes of train of the periscope and tubes are practically parallel; a slight difference in the parallelism of these axes will have but small effect; this can best be shown by a simple demonstration.



CL = axis about which roller path is inclined.
ABC = horizontal plane.
$A'B'C$ = inclined plane of roller path.
θ = $\angle$ of train in horizontal plane.
θ' = $\angle$ of train in inclined plane
α = $\angle$ of inclination of roller path.
$AA'B'B$ = vertical plane parallel to CL.

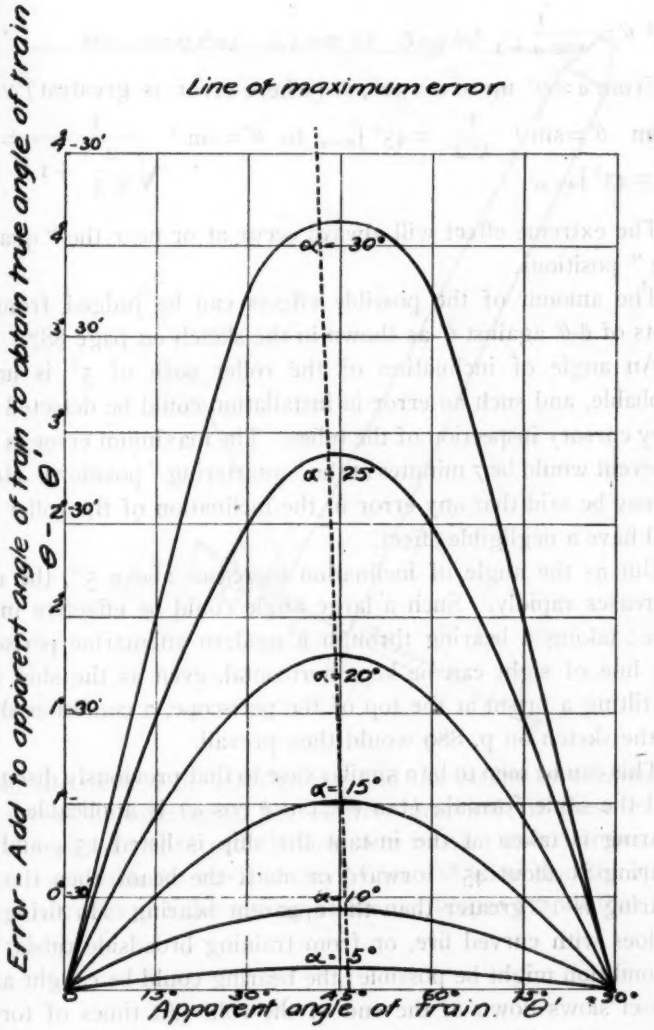
By inspection of figure,

$\tan \theta' = \tan \theta \cos \alpha.$

$\tan \theta = \tan \theta' \sec \alpha.$

$\theta - \theta' = \tan^{-1} \tan \theta' \sec \alpha - \theta'.$

$$\frac{dF}{d\theta'} = \frac{d(\theta - \theta')}{d\theta'} = \frac{(\sec \alpha - 1)[1 - \sin^2 \theta' (1 + \sec \alpha)]}{1 - \sin^2 \theta' + \sin^2 \theta' \sec^2 \alpha}.$$


Line of maximum error
Error - Add to apparent angle of train to obtain true angle of train
θ - θ'
4-30'
3°30'
3°
2°30'
2°
1°30'
1°
0°30'
0°
α = 30°
α = 25°
α = 20°
α = 15°
α = 10°
α = 5°
0
15°
30°
45°
60°
75°
90°
Apparent angle of train. θ'

Where

$\frac{dF}{d\theta}=0$, $\theta-\theta'$ is a maximum, and $[1-\sin^2\theta'(1+\sec a)]=0$.

$\sin^2\theta'=\frac{1}{\sec a+1}$.

From $a=0°$ up to $a=30°$, θ' (where error is greatest) varies from $\theta'=\sin^{-1}\frac{1}{\sqrt{2}}=45°]_{a=0}$ to $\theta'=\sin^{-1}\frac{1}{\sqrt{\frac{2}{\sqrt{3}}+1}}=\sin^{-1}.68=43°]_{a=30°}$.

The extreme effect will always occur at or near the "quartering" positions.

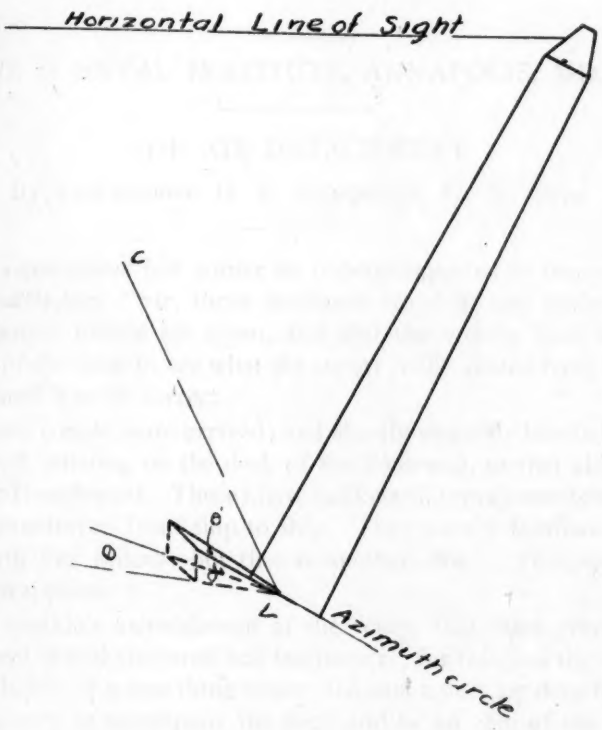
The amount of the possible effects can be judged from the plots of θ-θ' against θ' as shown in the sketch on page 887.

An angle of inclination of the roller path of 5° is hardly probable, and such an error in installation could be detected by a very cursory inspection of the tubes. The maximum error in such an event would be 7 minutes at the "quartering" positions. Hence, it may be said that any error in the inclination of the roller path will have a negligible effect.

But as the angle of inclination increases above 5°, the error increases rapidly. Such a large angle could be effective in this case; taking a bearing through a modern submarine periscope, the line of sight can be kept horizontal, even as the ship rolls, by tilting a prism at the top of the periscope, a condition shown in the sketch on p. 889 would then prevail.

This can be seen to be a similar case to that previously discussed, and the same formula ($\tan\theta'=\tan\theta\cos a$) is applicable. If a bearing is taken at the instant the ship is listed 15°, and this bearing is about 45° forward or abaft the beam, then the true bearing is 1° greater than the apparent bearing. In firing torpedoes with curved fire, or from training broadside tubes, such a condition might be possible; the bearing could be caught as the vessel slows down at the end of the roll. At times of torpedo firing, either in peace or in war, the feasibility of making such a correction in practise decides whether the above discussion is merely academic or practical. The writer does not believe the discussion as regards inclination to be of very great practical value,

except in so far as the curves show the tendency to err, and what modifications must be made in the estimates preliminary to firing as a result of this knowledge.



But the method of boresighting and the means of eliminating the errors of installation are entirely practical; if these errors are eliminated, the torpedo is limited to its own uncertainties, and those responsible for the accuracy of fire will know that the installation of tubes and the setting of the periscopes are all that they should be.

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THE AIR DETACHMENT

By COMMANDER D. E. CUMMINGS, U. S. Navy

At Guantanamo last winter an orderly reported to the captain of a battleship, "Sir, three seaplanes stood in and anchored." The captain looked his scorn, and sent the orderly back to the officer of the deck to see what the report really should have been; and found it to be correct.

Later a couple more arrived; and shortly ungainly kite balloons appeared, inflating on the deck of the *Shawmut,* mother ship for the Air Detachment. These kites—awkward, unwelcome brutes—were transferred from ship to ship. They were a familiar sight to North Sea sailors—but that is another story. This story is about seaplanes.

The captain's astonishment at the report that three seaplanes had stood in and anchored was but natural; for this was the birth-unheralded—of a new thing under the sun, a fleet air detachment of seaplanes to accompany the fleet, and be an arm of the fleet, just as destroyers are an arm of the fleet. And the Air Detachment has been just that. Where the fleet has operated, there the Air Detachment has been; and has responded to every call. And since that day the Air Detachment has operated independently of a shore station, just as other ships do, except while the *Shawmut* was on trans-Atlantic flight duty.

From Newport to Jamaica this detachment has cruised by air; and it has taken part in fleet maneuvers and in events of note in various waters; but its comings and goings have been unheralded, and its very existence has been but little known. When the crew of the *NC-4* returned to the United States, four large seaplanes of the Fleet Air Detachment, operating under despatch orders, proceeded from Cap May to Rockaway through dense fog. The

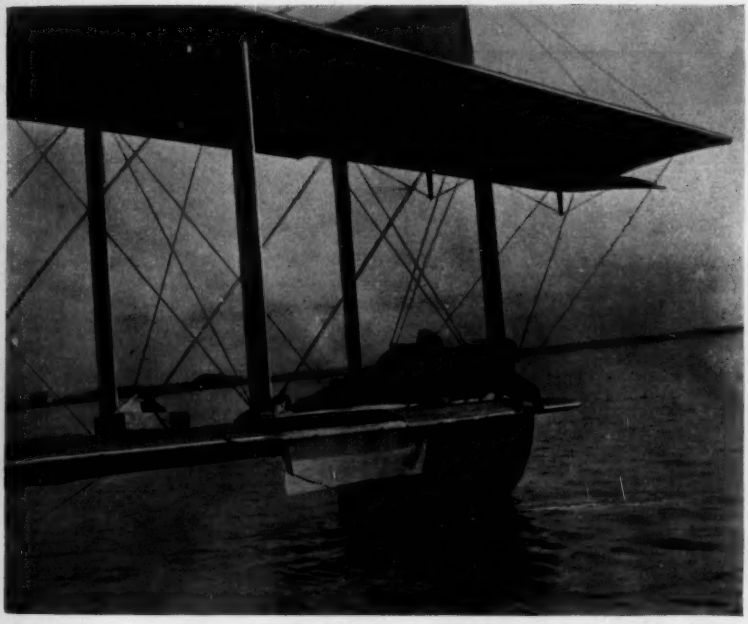
effect of fog in aerial navigation has been well advertised in connection with the trans-Atlantic flight. This case was somewhat different. The NC's had to find land. These planes could find land alright, but the question was to know when they had found it; for they could not come down to find out without danger of landing in a hotel. One did come down to where the sea was visible; and suddenly sighted a hotel dead ahead, too close to turn. He fortunately had speed enough to zoom over it. Another found the shore line of Long Island and followed it, swerving around hotels at 70-knot speed, hunting for a recognizable spot from which

"F-5-L" AIRBOAT AT ANCHOR. WING SPREAD (TOP WING) 104 FEET. LENGTH OVERALL 49 FEET. WEIGHT, LOADED, 13,000 POUNDS.

to find a landing place. Eventually he got a glimpse of a smoke stack which he recognized, and landed blind on a bearing from it where sheltered water lay; providentially no boats were underneath. The others landed safely after adventures that would make most of us seek quiet places for a few minutes of untroubled meditation. Not so the air detachment. In a little while the steamer *Zeppelin* was reported, and the four planes got away—not in fog this time, but in wind and driving rain squalls—and circled about the *Zeppelin* to greet the returning heroes of the *NC-4*. You have probably faced a driving rain with wind behind it on the bridge or in an automobile. Have you ever tried it at 60 miles an hour?

These planes did it for two hours. When they came down, the rain had worn a sixteenth of an inch off the driving edge of their propellers. Next day the papers announced that "owing to the rain the airplanes were unable to go out."

The detachment anchored in the North River over the glorious Fourth, and left for Block Island the day the president arrived in New York. In two-squadron formation, three air-boats to the squadron, they escorted the *George Washington* from Fire Island



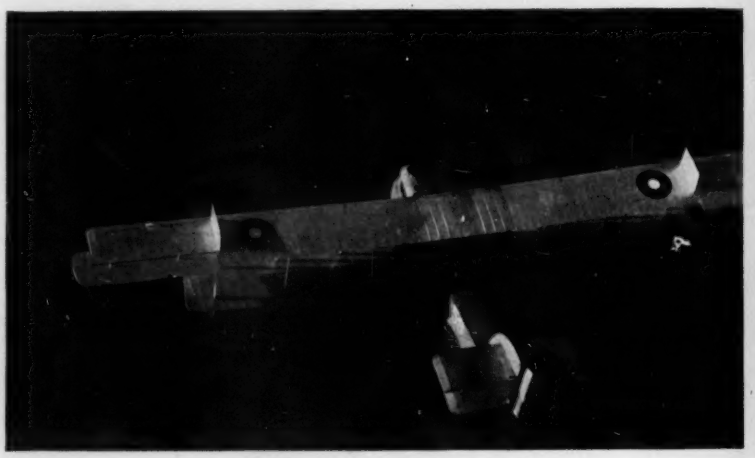
MAKING REPAIRS AFLOAT.

to Ambrose; and were rewarded by the announcement, in a service paper, that "Army airplanes met the *George Washington*."

These instances are the excuse for this story; for the service and the public should know about this organization, distinctly naval, which is accomplishing such excellent results as a part of the mobile fleet. Already it has demonstrated a usefulness and a practicability not before dreamed of. The possibilities and limitations of such a force are being demonstrated constantly. The fleet is beginning to realize what aircraft can do for them.

Some of their functions are very vital to the fleet. Does the fleet or the nation want to entrust these functions to a non-naval organization? Do they want their success in battle to depend in large degree on aviators who are interested in the navy? Or on naval officers who are also aviators?

In February, 1919, the Air Detachment flew by stages from Hampton Roads to Guantanamo. While there a ship and detachment organization were started. Air boats took part in numerous fleet maneuvers, visited Port au Prince and Kingston, flew a total of 24,000 miles (enough to encircle this little old world),



NUMBER "59" IN FLIGHT.

and flew back to Key West. Since the organization has got fairly underway, not a plane has been lost, and the detachment has never failed to have planes on the job per schedule for every call that has been made on them; and the calls have not been few. During the May and June fleet work off the Capes of the Chesapeake the detachment took an active part; then engaged in detachment work; accompanied the fleet in the North River, and has since engaged in detachment work during the re-organization of the fleet. To-day the organization of the force is such that it can with confidence undertake to do its part with the fleet under any ordinary conditions, and accompany the fleet from base to base and be ready when the fleet wants it.

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"THEM HALY-CON DAYS"

By CAPTAIN F. B. UPHAM, U. S. Navy

"Them was the good old days," when the quarterdeck was so sacred that a steerage officer set foot upon it only when, in port, he was suffered to relieve the officer of the deck for meals—said officer of the deck deliberately prolonging the hour, secure in the knowledge that no kick would come from him whose brief lease of authority was being proclaimed in loud commands to the messenger, the quartermaster, the bugler, the boatswain's mate.

Mayhap we had no afternoon drills, mayhap even the forenoon exercises were occasionally forgotten, but never so the quarterdeck, that area reserved for formal functions and for the recreation of the Old Man (spoken of thus in reverence, but under one's breath even at that). On occasion one did cross that hallowed planking on tip-toe, in civilian clothes, but then only for the convenience of the officer of the deck.

And there was that ward room ladder that one did not rate. Rude shock to him who but a few short weeks before had rated first class benches and other prerogatives reserved for the élite, to find himself and his kind reduced to such low estate, restricted to the use of only certain ladders, gangways, and boats—and these specially selected for their undesirability of one kind or another.

To venture into the ward room (and this of course only on duty) was to enter into sacred precincts, hastily and with resolution to make early exit lest some ward-room officer show signs of resentment at the intrusion. On rare, very rare, occasion one's division officer's invitation to dine in the ward room was shyly accepted, and one slicked up for the event as carefully as a lad first sitting up and taking notice of a petticoat.

To join a party of ward-room officers on shore was a treat not too often experienced lest one lose his perspective. Boat excursions, for days away on detached duty, with ward-room officers were even greater treats, for the discomforts of such travel, like one touch of nature, make the whole world kin; and one might even be permitted on such occasions to sit in on that greatest of national games, there to furnish sweetenings to lucious jack pots for the older and more skilled—a special privilege this, and reserved for detached duty. Later, returned to the ship, that duty completed, formalities were resumed, one became again "Mr.," and one carefully saluted and gave expression to morning greetings of politeness to every ward-room officer encountered. The bulkhead was in place again.

Was one of us one whit the worse for this makee-learn period, this period when our measure was being taken by officer and man, from the captain right through the ship's company? Whence this feeling of pride in the meticulous observance of these rites, each and every one, when showing visitors (and particularly one's own visitors) through the ship? Whence the special pride in having good old Dad join in the fancied scorn of the ward room and of the ward-room ladder, in order to be a regular fellow at the steerage mess table?

"Regular fellow!" One wanted, as does every normal human he-man in every generation wants, to be a regular fellow. The pride of fellowship is ever strong, and nowhere more so than among sea-going men, as evidenced by the word "shipmate." What finer word than this among shipmates?

Likewise was one's uniform the object of special note by a particularly gruff and seemingly dyspeptic gentleman known in those days as the First Luff. The officer of the deck was prone to neglect almost any duty, however important, sooner than that of drawing sharp attention to any slight deviation from the exactly correct. Unless one showed signs of being a hopeless misfit his division officer would make observation of such delinquencies in milder tone, showing thereby a sense of loyalty, but never did he neglect this duty, excepting he were one of those rare individuals who lacked self-respect and had therefore small respect from others.

Those were the days, 25 years ago, when Dewey was a captain, when days at sea were few, when days in port were many, when

one's pay, not princely even then, still was enough to accomplish one's education in the great game of experience—when a five-cent-nickel would buy a large schooner of cool beer, with deep snowy cuff attached.

Came a day when the home mail brought orders from the Bureau of Navigation assigning one to regular watch and division, and therewith promotion to the ward room and that aftermost state room, over the propellers where rest was impossible at sea, but where the new dignity made full amends. This was realization of all of one's ambitions. Who had ever thought of the far distant time when he should become the captain, or even the executive officer? Admirals were scarce, seldom to be seen, and generally to be avoided. No. A watch and division officer had reached his goal.

Frankly those were days of idleness, largely. After a tour of port watches, ending at 8 a. m., there came quarters at 9.30 and the morning drill (single-sticks!). Then for the beach! Three days and two nights "off." However strenuous that last tour "on," it had nothing on that tour "off!" One worked, and worked hard, during those long hours on board—watches, inspections, forenoon drills, mustering liberty parties in and out, catching naps in between (for one was ever behind on sleep and time on shore was too precious to be spent in sleeping).

Gunnery could not be said to have been a lost art; rather was it like that planet navigating space outside the orbit of Neptune, yet to be discovered. Ordnance there was, yes, of a ponderous kind, and one felt apologetic to it and to the gunner's mate when there was no escape from messing it up with a round or two of powder and shell—the real stuff, too!

Even coaling ship was a function not often indulged in. With the many days in port and the few at sea, one filling of the bunkers lasted reasonably long—long enough for the paint work to recover and for the personnel to forget about it. No all hands function that! No, sir! Coaling ship meant an exodus to the beach of every officer and man who could possibly escape. Remained only the gentlemen of the watch, and the deck and engineer divisions, exhorted from time to time by the officer of the deck whose principal duty, so believed that gentleman, consisted in passing the buck and in keeping as much as possible out of the dirt.

Now, nor I nor any man would recall those days of inaction, of plain loafing, save only on paper, and then only that I may picture a period of idleness, but a period, nevertheless, when the shade of Paul Jones would have found in that rigid bulkhead assurance that much was well with the heart and soul of the navy; and they be the index.

Let public apathy starve our material into inaction or degenerate us into an epidemic of scraping and painting, of bright work and holy stones, if so be it that we remain a personnel determined that the niceties of plain good manners, manners learned at home and polished up with military terms into military courtesy, shall not perish from the sea; if so be it that these manners of Paul Jones, of Lawrence, of Farragut, of Dewey; if these sea-manners passed down to us by these sea-gentlemen be preserved through us of to-day to sea-gentlemen yet unborn; if so be it we remain determined that the heart and soul of the navy shall not go to hell!

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A SUITABLE TOMB FOR JOHN PAUL JONES

By LIEUTENANT WM. E. MALLOY, U. S. Navy

To those who know Annapolis, the chapel of the U. S. Naval Academy is a familiar landmark. Comparatively few of these know that it holds the tomb of John Paul Jones, the greatest of our sea-fighters, and fewer still have ever visited his tomb. This is not due to any lack of interest on their part, but is because they do not immediately think of a chapel as a place of interest, and also because of the out-of-the-way location of the tomb. For my part, John Paul Jones was one of my boyhood heroes, and yet, during the four years I was at the academy, I visited his tomb but once, and then only because my mother wanted to see it.

This apparent lack of interest in the man who did so much to help us win the revolution on the sea would be overcome were his body entombed in a suitable memorial dedicated mainly to him. The sight of such a building would bring immediate thoughts of the man to whom it was dedicated, and thrill the observer as the incidents of his daring flashed through the mind. Owing to its prominent location, the chapel is the most suitable building for such a purpose, and it could, at a minimum of expense, be converted into an impressive memorial.

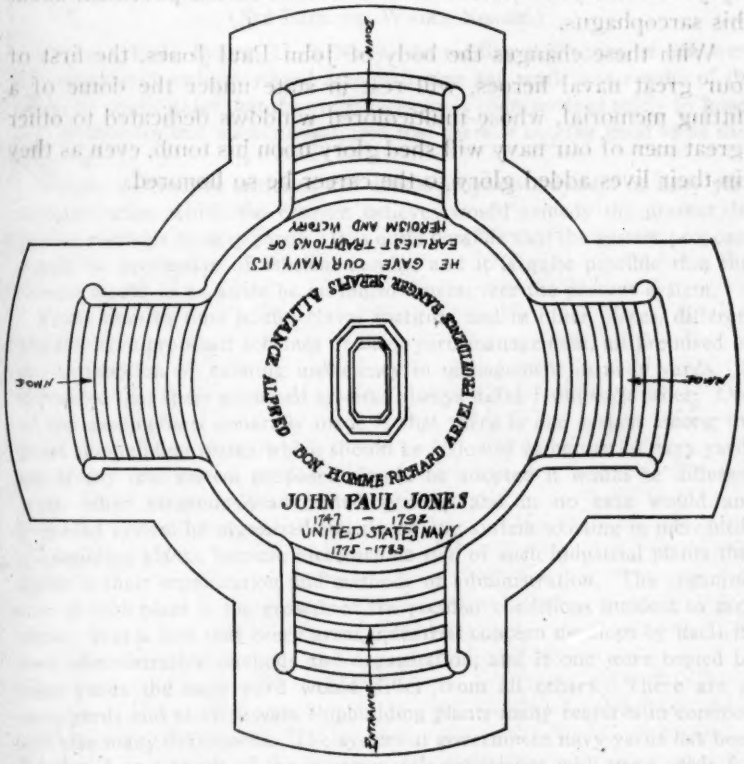
The present chapel is largely unsuitable as a place of worship. A careful examination of the building fails to disclose a single architectural detail, either exterior or interior, which has any religious symbolism or significance whatsoever. The acoustics are so poor that the audience halfway to the rear of the building cannot hear what is being said from the pulpit. Various attempts have been made to improve the chapel in this respect by hanging screens along the walls and in the dome with indifferent success. The building is entirely too small for the number of midshipmen

now at the Naval Academy, and the construction of a new chapel has become a necessity. Realizing the inadequacy of the present chapel for use as such, the Navy Department is drawing up designs for a new chapel, and plans to use the present building as a memorial museum.

It is the opinion of the writer that the chapel should not under any circumstances be thus converted into a general museum, for such conversion would confuse a visitor's mind as to the real purpose of the memorial. If, for instance, you go into Grant's tomb at New York you can almost feel yourself in the living presence of the rugged general whose body lies there in state. Were his tomb full of trophies and memorials concerning Sherman, Sheridan, Meade and other leaders of the Civil War, you could not possibly feel the simple grandeur of the nation's tribute to the man, nor would it be altogether clear in your mind that the memorial had been placed there in honor of him alone. As a proper recognition of the gallant services performed by John Paul Jones in our struggle for freedom it is wholly fitting that the chapel should be used mainly as a memorial to him.

In converting the chapel into a tomb it should be noted that the construction is such as would lend itself easily to a memorial similar in interior design to the tomb of Napoleon, and advantage should be taken of this fact when the plans for the interior are drawn up. The tomb of Napoleon is in the Dome des Invalides at Paris. The interior is in the form of a Greek cross, in the center of which, directly under the dome, is the crypt containing his sarcophagus. It consists of an open circular well 19 feet in depth and 30 feet in diameter. In the center is the sarcophagus of the emperor, which measures 13 by 6½ feet, with a depth of 14¾ feet, and is composed of five blocks of red porphyry from Finland, the gift of Emperor Nicholas of Russia. The mosaic pavement represents a halo with a wreath of laurels and bears the names of Napoleon's most famous battles (Rivoli, Pyramids, Marengo, Austerlitz, Jena, Friedland, Wagram and Moscow). Grouped about the tomb are ten marble reliefs. Surrounding the gallery are twelve colossal figures symbolizing the chief Napoleonic victories. Between the statues are aptly placed 54 flags, arranged in six trophies, which were taken at Austerlitz. A faint, bluish light admitted from above enhances the solemn grandeur.

In connection with the foregoing, it may be said that no extraordinary changes are necessary to convert the chapel at the Naval Academy into a tomb similar to the tomb of Napoleon, and the expense would be comparatively small. The present floor, balconies, and all chapel fittings would have to be removed, and a stone balcony built at the present floor level. The accompanying



SKETCH OF PROPOSED INTERIOR DESIGN.

diagram shows a suggested plan of interior design. It will be seen that there are four broad stairways cutting the balcony in the form of a cross, and leading to a lower level. Upon a massive base in the center of this lower level would rest the sarcophagus of John Paul Jones. In niches beneath the balcony would be placed symbolic figures or draped trophies of flags. The four small doors entering the diagonals of the present chapel would

be removed, and the entrances blocked up. In the spaces left blank would be hung paintings of John Paul Jones' famous sea fights. At the head of each stairway would be a splendid memorial window, and until such time as all the windows shall have been dedicated, the blank ones should be filled with glass of intermingling blue and purple. The names of the ships commanded by John Paul Jones would form a wreath on the pavement about his sarcophagus.

With these changes the body of John Paul Jones, the first of our great naval heroes, will rest in state under the dome of a fitting memorial, whose multicolored windows dedicated to other great men of our navy will shed glory upon his tomb, even as they in their lives added glory to the career he so honored.

DISCUSSION

Navy Yard Administration as a Problem in Industrial Engineering

(See Page 509, Whole No. 206)

Captain E. L. Beach, U. S. Navy.—In reading this paper, if one were not acquainted with navy yard administration and work, and results of the same, he might judge that the present system is characterized solely by hopeless inefficiency and wastefulness, and that there is nothing good to be said about it.

Besides destructive criticism this article proposes a system of navy yard administration which the essayist believes would remedy the present defective methods at navy yards. It is quite possible that the system proposed would be productive of efficient results, and it is quite possible that this system would in no sense be an improvement over the present system.

From time to time in the Naval Institute and in other places, different officers have proposed schemes of navy yard management, all premised on the assumption of existing inefficiency in management in navy yards. It is noticed that these proposed systems always differ from each other. One of the assumptions generally made is that there is one system among the great shipbuilding plants which should be followed at industrial navy yards yet if any one system proposed should be adopted it would be different from other strenuously-advocated systems and in no case would any proposed system be organized strictly on any system existing in mercantile shipbuilding plants, because there are no two of such industrial plants that agree in their organization and methods of administration. The organization at each plant is the growth of the peculiar conditions incident to each plant. It is a fact that every great industrial concern develops by itself its own administrative methods and organization, and if one were copied by navy yards the navy yard would differ from all others. There are at navy yards and at all private shipbuilding plants many features in common and also many differences. The system at government navy yards has been developed as a result of the government's experience with navy yards for over a hundred years. The endeavor is to suit the requirements due to the peculiar conditions of governmental control.

Without going into any discussion at all of the details of the article referred to, there is this much that is certain: That practically every great shipbuilding plant in the country has for its executive officers, former naval officers whose greatest training, generally, has been at navy yards. The result of navy yard work in its large aspect is such that has caused the Newport News Ship and Engine Building Company, Cramps Shipbuilding Company, the Bethlehem Steel Works, the Electric Boat Company, and

many other great commercial industrial concerns to go to navy yards for their different managers, and by offers of huge recompenses to induce officers whose training has been in navy yards to resign to accept positions of highest authority with them. It stands to reason that if the result of navy yard administration and work is of such a nature that the greatest industrial concerns, not in isolated instances, but practically unanimously, go to navy yards for their executive officers, that there must be some good virtue in navy yard administration. Instances could be cited where besides shipbuilding companies, electrical, ordnance and engineering experts of navy yards have been induced to resign to take up commercial work. The writer of the article in question, after about five years' continuous service at a navy yard, has just resigned to accept remunerative employment with high responsibilities in an industrial commercial works. The fact that naval officers on duty at navy yards frequently receive flattering offers for employment by the greatest commercial industrial plants in the country should be conclusive evidence to any one that there is some peculiar virtue and excellence in the methods and results of navy yard work.

Mr. Post, for many years the general manager of the Newport News Ship and Engine Building Company, once said to the writer of these lines that the great success and prosperity of his company was due practically entirely to the influence exerted upon his works by naval officers—constructors and engineers. He said about as follows: "The specifications of government work, which are drawn up by naval officers, demand highest qualities of workmanship and material. The constructors and engineers who are on duty at my works, charged with the responsibility of passing and inspecting everything done for the government, always insist on highest qualities of workmanship and materials. They are uncompromising and intolerant of anything except highest perfection obtainable. This, to us, was at first a bitter condition, but we were forced to accept the conditions and their spirit gradually worked throughout our plant. I consider that the effect of naval constructors and naval engineers upon the Newport News Ship and Engine Building Company has been of immeasurable value in bringing the whole plant to its high state of efficiency."

It is to be noted that after Mr. Post's death, a naval constructor, a product of navy yards, was made general manager of the Newport News Ship and Engine Building Company.

During the World War, navy yards built ships in faster time and at lower cost than corresponding ships such as destroyers were built at private plants, and it is to be noted that navy yard ships made faster speed. Battleships built at navy yards cost less than corresponding battleships built by private plants. Government-built torpedoes at the Torpedo Station, Newport, Rhode Island, cost appreciably less than the same torpedo built by private contract.

"By their fruits shall ye know them."

CAPTAIN A. W. JOHNSON, U. S. Navy.—1. It is agreed that there is room for improvement in the administration of our navy yards, and it is to be hoped that Commander Reed's article in the April issue of the

Institute will bring forth a discussion from which will come needed changes. The article should be read without prejudice and discussed calmly, solely from the viewpoint of how the shore establishment can best serve the interests of the fleet.

2. Commander Reed has been candid enough to say that he has considered the whole question only as a problem in industrial reorganization. He could not have made a more damaging criticism of his entire paper. To take the view he does, ignores the fundamental mission of a navy yard; and any discussion confined to these lines is liable to lead to erroneous conclusions.

3. A navy yard is a shore establishment for the maintenance of the fleet. The director of its internal policies, the commander, must be one familiar with the requirements of the fleet and one who by training and experience brings to his position the viewpoint of the commander-in-chief. Commander Reed's statement that "either work is industrial or it is military" is misleading. Work of any character pertaining to the navy is naval, and must be subject to the necessary naval control. There should be no mistake about this. As soon as it is necessary to design or acquire a thing for naval use, the organization which is responsible for its use must exercise the necessary supervision over its design and manufacture to insure that it fully meets its requirements. This does not mean that we should not avail ourselves of all practical assistance and all resources outside the service. We should eliminate the terms industrial and military from our discussion and think only in terms of navy. Commander Reed's remark that there have been failures under what he styles the "milito industrial" scheme betrays a desire to blame the "milito." What conclusion is to be drawn from the numerous industrial failures yearly recorded in Bradstreet's?

4. The administrative methods are susceptible of improvement; let us work together to improve them. This is not the time for controversy and jealousy.

5. The methods of internal administration of a navy yard should follow the sound principles of organization enunciated five thousand years ago by Jethro when he explained them to Moses (Exodus XVIII, 17-22):

"And Moses' father-in-law said unto him, The thing that thou doest is not good. Thou wilt surely wear away, both thou, and this people that is with thee; for this thing is too heavy for thee; thou art not able to perform it thyself alone. Hearken now unto my voice, I will give thee counsel, and God shall be with thee. And thou shalt teach them ordinances and laws, and shalt show them the way wherein they must walk, and the work that they must do. Moreover thou shalt provide out of all the people able men, such as fear God, men of truth hating covetousness; and placing such over them to be rulers of thousands, and rulers of hundreds, rulers of fifties, and rulers of tens.

"And let them judge the people at all seasons, and it shall be, that every great matter they shall bring unto thee, but every small matter they shall judge, so shall it be easier for thyself, and they shall bear the burden with thee."

6. These principles apply to organizations of every character. The personnel and the implements of warfare change; but the principle of organization, like the principle of warfare, does not change. We find them in the sound organization of every battleship where the manifold activities are quietly and efficiently carried on under most varying conditions. No battleship has an industrial manager independent of the captain. Here the commanding officer is vested with ample authority, possessed of the necessary power to enforce it, and alone held responsible for the efficient execution of his mission. He in turn delegates authority and responsibility among his subordinates. Authority and responsibility go hand in hand. If this principle is violated the organization will be a failure. A sound organization with inefficient personnel is deplorable, but will survive an unsound organization even if the personnel is efficient. We cannot make every man a sailor by putting him into a sailor suit, but there are some good sailors in sailor suits. Navy yards should not be selected for the commandant but the commandants should be selected for the navy yard.

7. The writer compares the respective capabilities and responsibilities of a commandant and the president of a shipyard. The comparison is hardly fair. I do not believe the writer, or any one who is not familiar with the working of a commandant's office, is capable of appreciating the difficulties of the position, on account of its many restrictions.

8. With little experience as a cog in the organization of a navy yard, I have observed in an impartial spirit the work done at various yards on vessels in which I have served. Interest in the work has led me to follow it through the various shops, carefully watching the processes and noting the methods of administration in the offices, and to know many of the clerks, storekeepers, foremen and other workmen employed at the Boston, New York, Philadelphia and Norfolk navy yards. Weary months spent at Fore River and New York ship yards watchfully waiting the construction of the *Downes* and *Kimberly* and a shorter time inspecting the building of the *Conyngham* at Cramps have furnished me opportunities to gauge something of the efficiency of the private establishments, too. As far as quality of workmanship and design is concerned the navy yards do not suffer by comparison with the private shipyards. As to methods of administration the private shipyards have a decided advantage, but their problems are simpler and their efficiency is measured solely by the profits made for the company. The application of the cost plus 10 per cent knocked efficiency into a cocked hat, from the point of view of the ship owners, and ultimately reacted unfavorably on the organization of the plant.

9. The general manager or president of a private yard has a free hand. In the first place he is dealing with but one kind of work. He is not bound hand and foot by innumerable Congressional enactments, by rigid rulings of the controller, by one hundred and forty odd appropriations carefully defining just how each particular dollar must be or must not be spent, and a critical auditor with a small army of clerks in Washington looking for technical flaws in the manager's statements. The general manager of a private yard is not limited in the choice of his employees by innumerable

regulations and restrictions of the Civil Service Commission conceived for safeguarding the rights of the employees, but so complicated and burdensome as to almost defeat their very object. Does he have to ask Washington for permission to discharge a messenger boy for some misdemeanor or even suspend him for half a day? Can the commandant of a navy yard prevent the general manager of a competing shipyard from taking his best draftsmen by offer of much higher wages than may be paid at the navy yard? Would the civilian president of any establishment be required to employ outside trucks at great expense and keep idle his own because the particular bureau allotment covering the pay of his chauffeurs has been expended or because the appropriation for gasoline has run out? Would he, in order to transfer an employee from one appropriation to another, have to recommend such transfer to Washington and await its approval before making it, no matter how urgent such transfer might be for the benefit of the government or even of the employee himself? An enumeration of these restrictions would fill several pages, without mentioning the political pressure in favor of this or that employee, or measures, constantly at work without regard to the efficiency of the yard or navy. (Unless navy yards are allowed a reasonable degree of freedom in the management of details which do not bear on broad questions of administration, they will never reach a satisfactory state of efficiency.)

10. Commander Reed has made a point of the large investment of government funds in navy yards, and of the responsibility to the people for their economical expenditure. This is important. It is still more important to keep in mind the necessity of economical management of the navy as a whole. The maximum fighting efficiency for every dollar spent, whether for repairs, construction or wages, is the point to be considered. Real economy is effected only by the wisest expenditure of the entire naval appropriation. To insure this it has been proposed that the executive or operating branch of the navy exercise supervision and be responsible for the expenditure of these funds instead of allowing each bureau exclusively to allot its own funds to its particular activities. It follows that such a plan should require that the administrative head of the yard or ship coordinate the expenditure of funds allotted to the various yards and ships as is now done by the captain of a destroyer in the case of title X, stores. This point was brought out recently where the bureaus allot funds for work on vessels without sufficient regard to each other. This is not always the case but the following serves as an illustration. One vessel was completed by the hull division but could not proceed to sea, on account of lack of funds to complete S. E. repairs, while a similar vessel at the same yard was completed by S. E. but could not be finished by hull division on account of the depleted funds. A little responsibility attached to the captain of a battleship for the economy of operation, upkeep and repairs of his own ship would go a long way towards reducing expenses. Imagine what a saving would be effected if 10 per cent of it could be applied to increased pay or wages.

11. There are many useful suggestions in Commander Reed's paper. Some have been adopted and others doubtless will be in time, but there

are others which are not desirable. Such improvements as lie within the power of the department or navy yard officials to make should be made, and a careful study of Commander Reed's paper and organization chart is recommended to them. As he says, we have different organizations at our yards. There are good and bad points to be considered and much can be done by the navy to extend the good and eliminate the bad. I believe no two yards have identical organizations or methods of administration. Take Boston, Philadelphia and Mare Island. These are under what Commander Reed terms the "good old commandant scheme." At Boston there is a central office with drafting room, planning and estimating sections, and correspondence files in the same building. The commandant works in one room, the construction and engineer officer in an adjacent one in the same building. At Philadelphia they occupy offices in different buildings widely separated. At Mare Island, all three occupy the same room. Portsmouth, New York and Norfolk have the "industrial type of administration." In Portsmouth the commandant and industrial manager occupy different buildings, but the industrial offices are in the same building. The organization is similar to the one proposed to Commander Reed. In New York the commandant and industrial manager are in the same building; but the construction, engineer, public works, and supply officers are in separate buildings widely scattered. There are five drafting organizations, separate filing systems, independent planning and progress sections. At Norfolk these offices are in the same building. The methods of routing and planning work, of carrying on correspondence, obtaining supplies and of handling surveys considerably in all of these yards.

12. In the present organization of the New York Yard, it is specified by department order that the commandant will have charge of the strictly military activities of the yard and the industrial manager of the industrial activities. It does not specify what are and what are not military activities or who shall define them should the question arise. If it were practicable to define them the labor of classifying them would be as great as the compilation of the departmental compendium covering the cognizance of work of the material bureaus. To illustrate, would the removal of a steel splinter from the eye of a sailor be military, and from the eye of a laborer industrial? Would cleaning the ship's bottom by the ship's force be a military operation? And if the commanding officer differed from the industrial manager as to how the crew should do it, who would settle this point, the captain, or the industrial manager? Or should it be referred as a military matter to the commandant? The order does specify that the commandant shall have charge of the yard police, commissary store, medical department, yard craft, berthing of ships; and military command of ships at the yard for industrial purposes. The commandant also has jurisdiction over so much of the general storekeeper's department as relates to material not intended for industrial purposes. A list of articles classed as contraband in International Law would cover most of the material handled by the supply officer. The commandant is also responsible for contract work performed in the navy yard, *i. e.*, paving a yard street by contract would be under the commandant, whereas paving an adjoining

street by the yard force would be under the industrial manager. Cases have occurred where the contractor has actually taken yard workmen who were paving one street for public works and, by paying them higher wages, put them to work on another street which he had the contract to pave. By law, the commandant is responsible for the expenditure of government funds in the yard, but the department specifies that he shall exercise no control over the work. The accounting officer is under the industrial manager, yet the commandant is responsible that there shall be no over-expenditure of funds. The order provides that the commandant shall have charge of courts and boards, and that no officers attached to the industrial department shall have military duties.

13. It will be seen that the supply officer and public works officer are under two heads. As the public works officer is also public works officer of the 3d District, he actually is under three heads. All of the above confusion comes from the fundamental error in trying to make a distinction between industrial and military activities where such activities are all naval.

14. Navy yards should be organized on the plan best suited to accomplish their primary mission of maintaining the fleet. Shipbuilding and manufacturing are secondary considerations. The desire to compete with private shipbuilding establishments has a tendency to develop the production of navy yards at the expense of other activities essential to maintenance of the fleet. Shipbuilding at navy yards is desirable when it promotes the efficiency of the organization. This it does by providing employment when other work is slack thereby preventing excessive layoffs. It enables the yards to set a standard of workmanship and costs for naval work, and to keep within reason the charges by competing contractors. But to compare a navy yard with a shipbuilding plant is as illogical as comparing a battleship to the *Mauretania* or a destroyer to the municipal ferry.

15. The organization should have at its head one who can best appreciate the relative values of all of the necessary activities at a navy yard to insure its well-balanced development. The natural desire of each bureau to push the development of its own interests has at times resulted in the over development of some activities at the expense of equipment or space essential to other needs of the yard. The influence of power exerted by the different bureaus varies from year to year or with changes of administration and is a matter in which personality plays an important part. It is obvious, therefore, that the commandant should be free from prejudices or alliances with any bureau. The moment one seeks to establish a separate corps to control and operate our navy yards he takes the first step to divorce them from the navy.

16. There is nothing in the exclusive jurisdiction of the commandant over matters pertaining to work in a navy yard incompatable with permitting heads of divisions to freely communicate with the department or bureaus direct. But the commandant should not be kept in total darkness of what is going on. A manager, assistant to commandant, or whatever we choose to call him, should be under the commandant to promote the efficiency of the navy yard work by removing from the commandant some of the burdens of the minutiæ of the work of the yard to give the com-

mandant more time to plan and to have a better perspective of the needs of the whole establishment. The relation between the manager and the commandant in the matter of repairs and construction should be similar to that between the executive officer and captain of a ship.

17. Commander Reed condemns the personnel and organization of the navy yards and offers something which he believes is better. What is better should be adopted. The suggestions regarding the training of young officers are excellent, and the standards of education, experience and qualities prescribed as desirable for the manager are desirable even for a sea-going officer. But it is significant that no mention has been made of the sublime quality of loyalty to the service. The personnel of the yard organization should of course be industrious, and each individual moreover should have the interest of his work at heart. Elimination of loafers and incompetents ashore will not improve the fleet by assigning them exclusively to sea duty. The navy does not need them. The loafer is a loafer whether ashore or afloat. There are some officers ashore, of all corps, who are imbued with the naval spirit, and there are some sea-going officers who never have known it. The latter would be the first to seek a place in any exclusively shore-going corps. Naval officers may be jacks of all trades and masters of none, but there are many who are neither jacks of all trades nor masters of any. In the professions, and in the trades, there is a tendency towards over-specialization testified to by the increasing burdens on the pocketbook and the ever-growing complements in many battleships. Society has a need for general practitioners and jacks of all trades. So has the navy. Naval men live in an engineering and nautical atmosphere. They lose nothing by a working knowledge of many trades or by a mastery of more than one. The quality of resourcefulness is an asset to every naval man; and its development must not be neglected.

18. President Hayes once remarked that the "ins" are always in favor of centralization, and the "outs" in favor of decentralization. This I think is at the bottom of all our trouble. The only logical solution comes with the centralization of policies and decentralization of details. By mutual sympathy, understanding, and confidence efficiency will be achieved and the navy yards will thus better serve the fleet.

COMMANDER M. G. COOK, U. S. Navy.—I have read with considerable interest the article in the April number of the Institute.

I presume the author intends us to consider his article seriously as a real statement of what he thinks is wrong with our navy yards and not as it appears on the surface, as merely a Parthian shot from a disgruntled ex-officer of the navy. If so, and entirely outside the author's freely expressed opinions of the whole navy including that corps to which he formerly belonged, the article is an entirely undeserved and gratuitous attack on our navy yard management. It is filled with disingenuous and misleading statements, and proceeds from false premises to unacceptable conclusions.

Before beginning the examination in detail of the subject matter of the article, I desire to present my qualifications for so doing. Otherwise

this discussion might be dismissed as mere "fireworks" from one of the empty-headed personnel who make up, according to the author, so large a majority of the navy. It is true I have no first-hand knowledge of that classic example of economy and efficiency, the municipal government of the city of Philadelphia, but I have in the past year visited all the navy yards and practically all the ship yards having navy contracts situated on the Atlantic and Gulf coasts. Prior to the war I was on duty at one of our West coast yards, and during that period visited the other West coast ship yards and naval stations. I have at various times met and talked over systems of management and the industrial situation with representatives of all these establishments.

As a result of my investigation I am fully convinced that, generally speaking, our navy yards are fully as efficient and economical and perform as satisfactory and reliable work as any of the ship yards with which their size or equipment would permit them to be compared.

Referring especially to the New York Navy Yard, and the Newport News Shipbuilding and Dry Dock Company, both mentioned in the article, so far as these two establishments are comparable neither has any essential point of superiority over the other. In making this comparison it is to be remembered that the Newport News ship yard is mainly engaged in shipbuilding and only undertakes repair work as a subsidiary feature. Actually, recently this yard has refused to enlarge its facilities for handling repair work. The Industrial Department of the New York Navy Yard is engaged mainly in repair work and builds ships only as a side issue. As a matter of fact shipbuilding at our navy yards was undertaken prior to the war not because the navy yards were eminently well fitted to undertake this work but primarily to afford them steady employment through dull seasons when all vessels were withdrawn for target practice, maneuvers or foreign cruises.

The author starts by asserting that our yards are not *military* establishments. I challenge this statement. If we admit the author's assertion, then logically the United States Government has no business owning or operating them at all. If they are industrial enterprises the government, following its fixed policy in the matter of other utilities with which it finds itself from time to time possessed, should dispose of its navy yards and let by contract with private establishments the business of repairing, refitting, equipping, provisioning and outfitting our ships. If the navy yards are to be retained as government utilities, then the government should, to be consistent, purchase all competing ship yards, and monopolize the ship yard industry.

But the navy yards are solely and exclusively *military establishments.* They have always been so regarded by our government just as the British dockyards are so regarded by the Admiralty. Such apparent industrial features as are found in the navy yards have been grafted on them from time to time, in order to save annoyance and delay to the government in procuring materials elsewhere or in order to provide a fairly uniform amount of employment for the personnel. They have grown immensely

in recent years but their growth has, on the whole, been commensurate with the increase in tonnage of our navy and with the growing complexities of naval construction and naval engineering. Throughout, the navy yards have been regarded as essential parts of our naval establishment, our main naval bases upon which the life of the fleet, the nation's first line of defense, depends.

Let us now examine in detail the reasons advanced by the author for junking our present system of navy yard administration and substituting for it what is, at best, a galling and unbearable self-perpetuating bureaucracy.

The telegram given as exhibit "A" is in itself neither an indictment for or against the present system of management. The information conveyed by the message may not have been specific, it was trivial, it did not contain the information sought, and it apparently aroused the ire of the receiver, but unfortunately, most information received in time of war is of just this character. I do not see where the author advocates a war college course in formulating orders for the members of the proposed Council of Thirty, and it is even possible that a staff composed of members of this illustrious body might be so insufficiently indoctrinated as to send similar messages.

The horrible example given concerning the location of offices at the New York Navy Yard is largely due to the unwillingness of Congress to authorize the construction of a modern central administration building or to appropriate funds for the conversion of one of the existing buildings. Even the most efficient manager of any of our ship yards, even I fear, the author himself, would, to drop into the vernacular, stand a "fat" chance of getting anything of this nature out of Congress while that economical body is in its present mood.

Taking up now the examples of so-called duplication of effort at the yards, most of them at the very worst will be found on examination to be survivals of the old bureau system, which on account of local reasons, personal characteristics or fear of disrupting the established methods of doing business, commandants and industrial managers have tolerated rather than encouraged.

The old fight between the riggers and laborers at one of our West coast yards was one of these legacies from the old system. Both foremen are able and highly efficient employees but are temperamentally unfitted to work together. The equipment of each gang is small and comparatively inexpensive and each successive commandant has wisely considered that what little would be gained by consolidation would probably be more than lost in friction and inefficiency. Neither, at least a few years ago, had a separate shop, the laborers being based on the pipe shop and the riggers on the outside machine shop.

Whether or not there should be such an animal as an "inside shipfitter" I am not prepared to state. It looks as if all the work performed by these men could be more efficiently and economically done by the machine

shopmen, but I will be charitable and assume this is also another hold-over case in which the commandants have considered it advisable to maintain the *status quo-ante*.

The conflicts as to cognizance of work mentioned in the article primarily arose between the workmen themselves and are caused by the jealousies existing between closely associated (but not allied) trades. The question as to whether the manufacture of uptakes and smokepipes are properly the work of boilermakers I am perfectly willing to leave to the International Union of Boilermakers and the Amalgamated Association of Sheetmetal Workers, Tinsmiths and Cornicemakers to decide, with the estimable President of the American Federation of Labor as referee. No doubt it would appear to those who consider a boiler to be essentially a collection of riveted plates that it might be built more cheaply by shipfitters but as a seagoing officer I am inclined to favor the present practice.

Questions as to the divisions of work between pipefitters and outside machinists and between coppersmiths and sheetmetal workers are in the same class as the preceding and have nothing to do with the management. They would arise under any system of management and any manager gifted with common (or uncommon) sense would be obliged to decide each case on its merits.

Such disputes are not confined to our navy yards. Anyone who has been so unfortunate as to have a house built in the past few years will easily recall many worse examples of hair splitting absurdities and trade jealousies existing among the various building trades.

I hold no brief for those unfortunate lieutenants, junior grade, who have incurred the royal displeasure of the author. If their principle offense is that of youth, they will no doubt in time outgrow it. I presume he refers to planning superintendents. In my time at the navy yard, this officer was supervised closely by the office superintendent and there was little chance for the former to subtract materially from the sum total of efficiency even if he were as inexperienced as the author states. In most navy yards the planning superintendent is little more than an assistant of the office superintendent, which position is always filled by the most experienced officer in the division next to the chief himself.

I have passed over the recommendation that the marines be removed from our navy yards. They have always garrisoned our naval bases and such duty is, at least by implication, part of the statute laws of the land. No more efficient, or highly organized and disciplined body of men has ever existed anywhere and they require no defense from me.

Similarly, the proposed removal of the uniform and even the word "officer" from the navy yard is a totally unnecessary and pernicious suggestion. The navy yards, as I have pointed out, are part of the navy. They must of necessity be governed and managed by officers of the navy. They are an integral part of our plans of naval defense and why any person should object to wearing the uniform of our ancient and honorable calling, especially while on duty anywhere, is beyond me.

As a matter of fact such lack of efficiency as exists at our navy yards at the present time, is due almost entirely to the laws under which we work.

In any organization we must start with the producer. In any scheme for betterment his efficiency is a primary consideration. No great increase in efficiency can ever be made so long as we have the present wage system, where the employee is paid by the hour and not by the job. This was long ago realized by Mr. Frederick W. Taylor and has been concurred in by all his numerous collaborators and successors as a fundamental theorem. At the very beginning we are confronted with a series of "Thou shalt nots" which make any change for the better well nigh impossible. We may not make a time study of any operation in a navy yard. We may not by the offer of a bonus stimulate any workman to increased output or improvement in the quality of his work.

The remedy he proposes, if remedy it is, is unworkable and impossible of accomplishment. It would lead even in its most harmless aspect to the creation of still another specialized corps in the navy, of which we already have too many. Before such system ever got to working we should find that the method of selecting the personnel would have passed out of the hands of the Navy Department and I haven't the slightest doubt that a Soviet system would be the eventual result.

The author leaves us to infer that our navy yard administration has stood still while industry generally has pressed forward. This is not true. In a little over 10 years we have abolished the wasteful and extravagant bureau system from our navy yards, introduced a modern system of managements (the Modified Vickers system), the result of a careful study of leading enterprises of a similar character the world over, established a model system of accounting, effected great consolidation of shops, centralized our power systems and storekeeping facilities, placed our workers under the civil service (a not unmixed blessing in some respects), put into effect a workmen's compensation law, and have made so many material improvements that one who visits our yards after a lapse of a decade would be at loss to find his way around them.

The system of management that we now have is one that is generally followed in the dock yards and naval bases of all the leading maritime powers. It is one that has stood the stress and strain of war and emerged on the whole with enhanced reputation. It should not, therefore, be lightly discarded for what may be theoretically a perfect system on paper.

In my humble opinion, again to paraphrase the author, at this time of general industrial upheaval, when labor is so widely disaffected and rebellion so openly preached in the market places, it behooves all to sit down in the boat, nor demand that the control of the helm be taken from the tried and proved pilots and entrusted to the doctrinaire or the hairbrained revolutionary.

U. S. NAVAL INSTITUTE

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Notice Whole Nos. 6, 7, 10, 13, 14, 15, 17, 144, 145, 146, 147, 149, 155, 167 and 179 of the PROCEEDINGS are exhausted; there are so many calls for single copies of these numbers that the Institute offers to pay for copies thereof returned in good condition at the rate of 75 cents per copy.

ANNAPOLIS, MD., May 15, 1920.

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PROFESSIONAL NOTES

PRFPARED BY

LIEUT. COMMANDER WALLACE L. LIND, U. S. Navy

GENERAL ARRANGEMENT

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FRANCE

FRANCE AND THE TREATY.—Our British statesmen are so absorbed at the moment in domestic political affairs that they appear to be losing touch with public opinion. Such at least is the only explanation that suggests itself for the Cabinet's singular attitude in regard to the French advance in the Ruhr district. When the news that French troops had occupied Frankfort and Darmstadt was made known certain journals which are believed to be in close touch with the Prime Minister hinted that the British Government was not in sympathy with the move, and might even "stand aside" altogether. The fact that such an unworthy policy could be contemplated by the government shows how completely official circles have lost contact with national opinion. With the exception of a few ultra-Ministerial organs, a majority of the newspapers in this country have signified their unequivocal approval of France's action. A disagreeable suspicion is gaining ground that our government is inclined to shirk its responsibility for maintaining the terms of the Peace Treaty, and that France is being left to shoulder most of the burden. We do not share this view, though we confess our inability to understand why there should have been even a moment's hesitation in pledging our support to France. Surely we are no less concerned than she in forcing Germany to observe what are by far the most important clauses of the Treaty—those which relate to the strength and distribution of the German post-war armed forces. These were the very clauses which Berlin sought to violate under the transparent pretext of restoring order in the Ruhr Valley. Had Gen. von Watter's troops been permitted to establish themselves in the neutral zone the prestige of the reactionaries, who have sworn to tear the Treaty up, would have been immensely strengthened, and Germany would undoubtedly have proceeded to still graver infractions of a document which—let us never forget—embodies the fruits of the victory we purchased at such a fearful price.—*The Naval and Military Record*, Apr. 14, 1920.

LICENSED PILOTS OF FRANCE.—The total of airplane pilots' certificates issued in France now stands at 15,576, of which 1732 were issued in 1919. The number of airship pilots' certificates totals 43, of which 12 are dated 1919, while balloon pilots number 448, but only three qualified last year.—*Scientific American*, May 1, 1920.

FRENCH MERCANTILE MARINE.—The reconstruction of the French mercantile marine is one of the most pressing national questions, and it is seriously occupying the attention of the government as well as of commercial and industrial circles. At present, the Senate has under consideration a government bill for granting a credit of 1,800,000,000 francs for the reconstruction of the merchant fleet. The state shipbuilding yards and those belonging to private companies, however, find it impossible to complete the work they already have in hand before 1922 owing to the difficulty experienced in obtaining adequate supplies of coal, steel and labor. The question is, therefore, asked, Why vote such an enormous credit if that is the situation?

The Ligue Maritime Francaise and several other maritime associations are urging the Senate to defer voting the credit until a definite policy for the French mercantile marine has been formulated and all the means for carrying it into effect have been thoroughly studied. On the principle that the merchant fleet must be augmented without delay, complete unanimity prevails. The difficulty is to know how this purpose is to be achieved without loss of time. In present conditions, it is not possible to charge the budget with expenditure which only concerns certain branches of industry, but the public is not opposed to the opening of the credit that is demanded for the reconstruction of the mercantile marine.

The French steamship companies have already purchased 700,000 tons of shipping, and have ordered a further 1,250,000 tons in France and abroad. They would certainly have ordered more if the steel plates placed at the disposal of the industry had not been severely limited.—*The Shipbuilder*, Apr., 1920.

FRENCH NAVY NOTES.—Recent events on the Rhine and elsewhere have served as an eye-opener to those sentimental Frenchmen, oblivious of past experience, who had placed their whole trust in the sacredness of solemn treaties, the permanence of tried alliances and universal disarmament, and who genuinely considered the time had come for our Republic to give up out-of-date military and naval pretences and adopt, instead, the defenceless attitude of the innocent and confiding lamb, confronting the hungry wolf. Pacificism, to thrive, requires, of course, deep ignorance of history. Whatever may be said to the contrary, might is right in practice, has shaped the map of the world, and has some chance to continue doing so, an eternal truth which the old Gaul chief Brennus forcibly expressed over 2000 years ago, when he threw his heavy battle blade on the scales in which Rome was weighing the price of her ransom, with the fateful words: Voe Victis! "Vivre c'est combattre," for any nation having rich lands in the sun, and resting on one's oars would mean death. Even victory can procure nothing more than temporary respite, contrary to the contention of those candid politicians who fancied that, from the very enormity of her sacrifices for the Allied cause (imperfectly realized in England), France derived special rights or immunity, and could, therefore, cast aside external cares and merrily return to mean pre-war internal squabbles.

Happily, there are signs that those hard facts will be manfully faced. The victory of Foch's armies placed France and Great Britain in a totally different situation relatively to Bocheland. Gone is the splendid navy created by the Kaiser, gone also the huge commercial fleet and the fine colonial empire of Germany—at least for a little time, whilst the North Sea is always there to keep at a safe distance the 70,000,000 subjects of the

United Imperial Republic of Bocheland, whilst but for the American armada, Britannia may be said to rule the waves more completely than at any previous time both for the number and quality of the men-of-war which she arrays in every ocean. Thus, as a legitimate return for the unique work of her grand seamen, and for her giant's deeds in creating a first-class army in record time, England is obtaining a great amount of security, even complete security for the present, if we put out of count the superior aerial fleet Bocheland has unlawfully preserved and kept on improving, the many super-cannons which she has refused to surrender, and the several possibilities she yet enjoys of rapidly reconstituting her underwater flotillas.

Vastly different is the position of France, that comes out of the fight for human freedom and civilization in an exhausted state, with 1,400,000 killed and dead from wounds, her mercantile navy reduced by half, her richest industrial provinces and collieries devastated and thoroughly ruined beyond words by an infamous enemy, and her pre-war trade and industry gone; and that can hardly be said to have gained anything like security as a reward for her unique toll of sufferings borne with a fortitude unprecedented in history, so long as under 40,000,000 Frenchmen are confronted by some 70,000,000 Boches united in a common desire for revenge and feeling all the more the need of "more land in the sun," since their maritime and colonial means of expansion have been wrested from them; so long also as the long list of reparations stipulated under the Versailles Treaty are not exacted from the unrepenting foe. The strict application of the Peace Treaty, which is, for economic and military reasons, a life-and-death matter for France, will only take place so far as she is militarily in a position to enforce it. In some respects the outlook is to-day worse than it was in 1914, when our Republic benefited by the prestige of the paper might of the Russian Empire. Since the disruption of the Czar's dominions and the reign of anarchy over Eastern Europe, not only could Bocheland manage to concentrate the whole of her strength on the Rhine, but it is an open secret she would have also the assistance of Bolshevist hordes. And, as there is a limit to human endurance and self-sacrifice, British pro-Germans would sooner or later have the joy of witnessing the collapse of the French resistance, though not for long. "Mihi hodie, cras tibi." In the light of history it is safe to say that the fate of France would be shared by Great Britain, and at no distant date. She would pay a similar penalty to that which France paid in 1870 for having allowed Prussia to successively crush Austria and Denmark in 1864-66. Danton's famous saying, "La guerre est l'industrie nationale de la Prusse," finds ample confirmation in the history of the 19th and 20th centuries, in the many wars which Bocheland waged out of cynical greed against her neighbors. Human nature does not change, as was noted by the grand old man of the Peace Conference, and it is instructive to compare the reasons which through passing centuries brought France and Germany on the warpath.

The Kaiser's challenge to Britannia, "Unsere Zukunft liegt auf dem Wasser," will naturally become the motto of greater Bocheland, overcrowded with population, teeming with large industrial centers and in pressing need of oversea markets. In contrast with agricultural, underpopulated France, the expansion of which is at an end, and whose sole ambition is the possibility of developing in peace her national assets, Germany is bitterly dissatisfied with her lot, and, should not France stand in the way, she would devote the whole of her efforts to naval armaments. Those who fail to see the community of Franco-British interests can thus boast of truly "travailler pour le roi de Prusse."

The dissatisfaction of France with the course of events is helping her to realize the value of "sacred selfishness" in international politics, which the eminent Signor Sonnino so wisely proclaimed when Italy, after mature

reflection, had decided to throw in her lot with the Allies. Parliamentary opinion sees in the possible isolation of France a fait nouveau justifying a larger outlay on armaments. The Boche peril, whilst mostly on land, is also naval, sea power being the only French asset of superiority in a duel with Bocheland, since it appears the intense fabrication of motors and aeroplanes has placed anew the enemy in a position of vantage in the air.

Minister Landry, who like Premier Millerand is a man of few words and of realization, has decided, without further ado, to develop those unique strategic assets which alone would be sufficient to make the French Navy a determining factor at sea, viz., the submarine and aerial flotillas and the colonial points d'appui. Given adequate coastal flotillas, the most important European sea routes would be under the control of France by virtue of her geographical situation. Whilst years would be required to produce a battle-cruiser fleet, the construction of efficiently-equipped flotillas, and even of super-cannon, may be made a matter of months, when are remembered the several great firms that have tackled submarine work and the wonderful improvization power of France, which managed, despite the loss of her largest industrial centers, to arm herself and her allies, even those allies who like America could boast of superior manufacturing resources. Let it be recalled that in 1918, whilst holding the largest combatant army on the widest front, the Republic was daily turning out 83,000 shells, 7,000,000 cartridges, 400,000 fuses and grenades, and the American Army "saved the Allies" solely with French matériel, having received no less than 3834 guns, 10,000,000 shells, 3800 aeroplanes, 240 tanks, and no end of machine guns from Gallic factories. These official figures are given merely to show that there is no minimizing the industrial power of agricultural France, and what she could do should her vital interests be anew threatened.

After visiting the naval aerial stations of St. Raphael, Aubagne, and Etang de Berre, Minister Landry has just crossed over in the 700-ton aviso Yser to Bizerta, where a series of improvements are being made that will enable the great North African base to eventually fulfil her geographical rôle, which is to assist Malta in commanding the Central Mediterranean route. Bizerta has proved, in the course of the war, of greater use than Toulon, and to a great extent justified the optimistic expectations formed as to its future. Premier Waldeck-Rousseau called it, in 1902, "un port sans rival," and in the opinion of another prominent statesman, Jules Ferry, "la possession de Bizerte valait la Tunisie toute entière" (it was worth taking Tunisia for the sake of Bizerta). It will be agreed that when all points are considered, no other Mediterranean point d'appui can compare with the Tunisian port, that has every advantage which geography can confer, viz., space and depth, two immense lakes where the whole of the French fleet and seaplane flotillas could move and train at ease, with an encircling screen of heights rising up to 1500 feet, the defensive value of which against aerial attack can hardly be exaggerated—and the whole of this a little over a hundred miles (40 minutes' seaplane flight) from both Sardinia and Sicily. On the other hand, human brain and labor have done more in Gibraltar and Malta, and the French had to have recourse to this latter harbor for the repairing and docking of their larger ships, such as the *Bart* and the liner *France*. No wonder the Paris Admiralty has decided, in addition to strengthening existing docks, to build larger ones of 300 mètres, capable of taking the battle-cruisers of to-morrow. The lake is also to be deepened, building slips for small craft are to be erected, the aerial station is to be modernized, and an auxiliary station created at Cape Bon, and preparations are also being made for the placing of super-cannon and anti-aerial batteries. The dispersal of the target, which is the first condition of an efficient anti-aerial defence, is, of course, susceptible of more easy realization at Bizerta than in either Malta and Gibraltar, and, whilst it is agreed mining, submarine, and aerial forces afford the best protection against enemy landing, every attention is

being given to the improvement of motor and railroads permitting the quick arrival of reinforcements and supplies. Finally, the development of the commercial harbor can but add to the value of Bizerta as a naval base.—*The Naval and Military Record*, Apr. 21, 1920.

REORGANIZING NAVAL SCHOOLS: TRAINING VALUE OF SAILING VESSELS: UP-TO-DATE BOILER POLICY: FRENCH VERSUS ITALIAN DREADNOUGHTS.—After reorganizing the Admiralty General Staff and Conseil Superieur (that will include as Permanent Committee for the present year Admls. Salaun, Lacaze, Amet, Schwerer, DuVignaux, and Varney), the next task Minister Landry has set himself is the modernizing of fleet training, and it must be acknowledged that there is in this line plenty of room for improvement, the Divisions des Ecoles de la Mediterraneé et de l'Atlantique going on in the old time-honored way just as if there had been no war. New principles, new material, new men are here the urgent need. Last year the Brest Ecole Navale received 60 élèves-officiers; this year the number is limited to 50, and rightly so, the Marine Républicaine having about four times as many officers as it requires, and an item of even greater interest—the competitive examination will include pretty stiff physical tests, such as racing, jumping—which neither Nelson nor Suffren would have satisfied, the former too lean and weak, and the latter being too fat. Yet it means a move in the right direction, physical strength and endurance being nowadays more than in the past a primary qualification in those called upon to assume the responsibilities of command in action.

In his amusing and instructive mémoires, Lord Fisher poured ridicule over the earnest proposal of one of his Admiralty colleagues asking, at this stage of naval science, for the construction of fleet sailing vessels. Yet, strange to say, there are not a few French naval men of the old school who have extended their warm sympathy to the British comrade who unwittingly fell a target to the terrible broadside of sarcasms and witticisms which the creator of the dreadnought school has ever in reserve for any opponent who comes within his range. "For after all," remarked an old capitaine de vaisseau, "it is primarily the human element, and not the naval machine, however improved, that wins battles, and the quality that makes for success in the human element is not mechanical skill or scientific knowledge, but aptitude to fight, with undiminished bodily and mental powers, on the stormy element; in short, it is seamanship. To believe that workmen can be with advantage substituted for seamen is to ignore the consistent teachings of all history. It was sea practice that won the day on the first of June, at Trafalgar and in every encounter of the Revolutionary-Imperial period. And similarly it was superior seamanship that came on top at Dogger Bank and Jutland. The Boches got the worst because they were more workmen than seamen, and—'remarquez bien'—the only German squadron that came creditably out of the conflict, that of von Spee, comprised the greater proportion of true seamen, a notable proportion of the complements of the *Scharnhorst* and *Gneisenaus* having been levied on the crews of the small gunboats of the *Eber* class, that were formed mostly of fishermen, used to roughing it on board small sailing vessels. Why do we consider Bretons as the very backbone of the French Navy? Why have all French admirals of the past been anxious to fight their ships with men issuing from the sea-beaten coasts that extend from the mouth of the Loire to St. Malo, and why are those matelots so devoted and stubborn and reliable in cases of emergency? Well, simply because they are seafarers from their youth, and born to the sea, and brought up mostly on small sailing craft, none too strongly built, and that are kept afloat and in good order by miracles of persevering energy and seamanship. Men who have passed through such a schooling—and Brittany and England alone possess that kind of sailors—I would confidently pitch against all comers. Besides, Duguay-Trouin, Surcouf, and

how many others have shown what could be done with all-Breton crews. The fact is sailing craft form the ideal nursery for bonâ-fide matelots; life in them is the only one that can enable man to get thoroughly familiarized with the varying moods of the choppy element and with the best ways of mastering it. The last war has afforded ample opportunities to appreciate the difference between born seamen and improvized sailors issuing from inland centres. The Black Sea rebellion told the tale. Fearless, disciplined seafarers alone make a fleet."

Sir Eustace d'Eyncourt's contention that the smaller type of water-tube boilers gave 30 per cent more power without any corresponding increase in weight is confirmed by the war experience of the French Navy. The ships of the 1900 and 1906-10 programmes were, it will be remembered, exclusively fitted with large tube evaporators of the Belleville and Niclausse types, mostly because mercantile and naval experience with Bellevilles had shown those boilers to possess robustness and easily repaired with the means on board. The test of the real thing, however, and the prolonged steaming which cuirassés and croiseurs had to do in the Mediterranean at the beginning of the war revealed the fact that quick raising of steam, and the faculty of maintaining high speed with only part of the boilers, is the quality most to be valued from the military standpoint. In this respect the croiseur-cuirassé Michelet (20 Guyots) gave better results than the Quinet (40 Bellevilles), and especially than the Niclausse-boilered Rousseau and Renan Ernest, thus confirming the decision of the 1913 Boiler Committee that proclaimed the superiority of small tubes and fitted them exclusively in the battleships of the *Normandie* class. In the *Flandre*, for instance, the small Belleville tubes have a diameter of 82 mils. against 115 for the large tubes of the Bart, which means a saving of 24 per cent in the weight and volume of the boilers and a much higher rate of combustion, going up to 225 kilos per square meter of grate. It is considered certain that the French quadruple-turret cuirassés would have been a success so far as steaming is concerned, and those who designed their motors confidently relied on obtaining 40,000 horsepower with over 23 knots, especially since the remarkable improvements realized with the new type of oil burners. In the dreadnoughts of the *Bretagne* type, the use has been given up as wasteful and dangerous of mixed coal and oil, and, instead, a part of the Belleville boilers have been made to use exclusively oil. These experiments, that had started before the war (with oil tanks and burners), have just been concluded, to the satisfaction of Admiralty experts, who appear eager to substitute oil for coal in all our warships, with a view to utilizing the petroleum wealth of French colonies. Stoking-rooms have been enlarged, and every care has been taken to avoid dangerous explosions. The *Bretagne* class now carries 450 tons of oil, possessing as much heating value as 600 tons of the best coal. In large tube boilers the normal consumption is reckoned to be 100 kilos per square meter of grate, whilst it would have been 135 kilos in the *Normandie*, and that would have been worth 180 kilos of coal.

The presence at Nice of an Italian battle squadron made up of the two newest dreadnoughts of the peninsula has naturally given rise to interesting comparisons. From the French standpoint, no doubt, there is not the least thought of a possible conflict with our Latin sister, for the twofold reason that there can be no vital danger for France coming from that source, and that France covets no part whatever of the Italian dominions. Sentiments, however, do not govern the world, and in the light of pre-war and post-war incidents it would be folly to exclude the possibility of a conflict, and very wisely our "Latin brothers" do not exclude it. Signor Nitti, some time since, was legitimately proud to proclaim that Italy, with her fifty-five million white subjects, had now become the premier Mediterranean power, at the same time as the Roman Admiralty, computing spoils from Austria, announced officially that the peninsula navy had realized a 20 per cent superiority over the Gallic fleet. These assertions, strange to say, failed to

produce uneasiness among Frenchmen, who have all along been inclined to under-estimate Italian possibilities and ambitions, and to take lightly the verbal achievements of our Latin sister. "L'Italie, c'est le midi et demi!" (Italy is a land of amiable bluster and bombast half again as much as is Southern France), Adml. Bienaimé once publicly proclaimed in the Chamber, and this opinion may be said to sum up French sentiment on the subject. It appears to be partly justified when is remembered the fate of the successive pre-war naval programmes of the peninsula, every one of which was to reduce France to the humiliating rôle of "playing second fiddle" in the Middle Sea. So long as naval power is not made up of eloquence and good intention, but of financial and industrial power, France will have some little chance of holding her own in the Mediterranean.

There is no denying the fine ensemble of fighting qualities that has been worked in the 22,500-ton *Andrea Doria* and *Duilis*, that were, beside, constructed with record speed with the cooperation of British and American industry, having been launched within 13 months of the laying down of the keels. With their thirteen 12-inch guns, throwing 920-pound shells, and their 22.5-knot nominal speed and 9.4-inch belt, they are rightly claimed to possess, relatively to their size, the highest military utilization in the dreadnought class, and it is noteworthy that the Gâvres formulas ascribe to them a paper superiority over the French *Barts* and even the *Bretagnes*, namely, 2330 points against 2122. But in practice it is doubtful if they are better fighting machines than their French rivals. Italian critics themselves have denounced their notorious weak points, viz., the "salade russe" of their mixed turrets, their precarious stability, insufficient armor (Italia-aero-marittima). The *Barts* are much superior end-on, little inferior broadside owing to the poor rate of fire of triple turrets, and they have thicker armor. Moreover, the *Bart* has developed 42,000 horsepower and may be faster at sea, which applies also to other Belleville-boilered ships. As to the *Bretagnes*, which oppose 540-kilo shells (containing 25 kilos melinite) to Italian 407-kilo projectiles, their fighting advantages are obvious, as they would be in a position of securing the first hits and of striking harder, at the same time being capable of withstanding with impunity heavier punishment. So many arguments for the French side. On the other hand, French Mediterranean superiority is not such as would justify any crowing about sea power no longer being measured by weight of broadsides, and Italians having a substantial asset in the superior speed of their scouts and destroyers. The completion of the *Normandie*, together with the quick construction of the projected éclaireurs, is required to enable France to reap the diplomatic advantages that logically belong to the premier Continental Navy.—*The Naval and Military Record*, Apr. 14, 1920.

FRANCE'S MARITIME FUTURE.—Stagnation, inertia, and gradual decline, such is outwardly the spectacle which the Republican Navy would give to a distant observer. No expansion of the matériel worth noting, besides the completion of 700-ton avisos, of 500-ton submarines, and of "poussiere navale et aérienne." The building of the projected 5200, 2500, and 2000-ton fast éclaireurs and conducteurs d'escadrilles is yet in the preliminary stage; the fate of the 25,000-ton *Normandies* is in the balance, as is also that of the designed super-battle-cruisers. Training is mostly at a standstill as the twofold consequence of the instability of crews and of the inadequacy of pre-war methods; it awaits deep transformation. And with regard to the staff, a growing number of officers, especially of the constructional and engineering branches, are leaving the naval service to don the uniform of the great mercantile companies. Expressions of dissatisfaction with the state of affairs are only too frequently heard in every naval center, whilst the unending series of courts-martial and of acquittals "avec les félicitations du jury" of those many commanders who have lost their ships,

through accidents, in the course of the war saddens the heart of patriotic citizens who value discipline and manliness. The lack of discipline among mercantile crews is combining with the shortage of building materials to delay the renovation of the "marine marchande." Not a week passes without some strikes of "inscrits maritimes," and our great ports have become hotbeds of anarchy. Truly many signs of an unsatisfactory situation.

At the same time, there is no ground for pessimism when are reckoned the wonderful recuperating powers of old France and her several new assets on the sea. The Gallic Navy is passing through a temporary crisis that will only be of short duration, as can be judged from significant symptoms. As the result of the lessons of the war and of the naval propaganda in schools, lecturing halls, and daily organs, French public opinion is getting alive, as it never was before, to the fact that sea power is a vital need to France both in peace and in war. "La France doit retrouver sa grandeur navale passée ou se résigner à mourir" (M. Rondel-Saint, head of the Ligue Maritime, in the Palais du Trocadéro). No curtailing of the naval expenditures is to be feared on the part of the new Chamber that comprises a huge majority of patriotic members elected on the morrow of the war, every one of them aware that the most expensive armies and fleets are cheap when compared with even a victorious war. Once France has made up her mind to be strong on the water, she will have ample means of realizing her legitimate ambition, her financial and industrial means being only second to those of the United States and of Great Britain. The actual national wealth Senator Besnard in his book "La France de Demain" estimates at 800 milliard francs, from which a debt of 250 milliards is to be deducted. The recuperation of the Lorraine iron ore mines and steel works means much, but a better asset of the future is to be found in the discovery that Brittany and Normandy contain iron ore fields infinitely more extensive and richer than those of Lorraine, without mentioning the many petroleum wells that are among the assets of French North Africa.

The naval policy of to-morrow has just been the object of debate in the Chamber, but which, although inconclusive, threw some light on the trend of Parliamentary opinion. It was a grand day for la jeune école, so far as eloquence is concerned. Mons. de Kerguézec, an influential Breton député, denounced with great heat and apparent sincerity the defencelessness of French coasts in 1914, and mercilessly poured ridicule on the eminent medical man in charge of the Rue Royale administration at the moment of Boche aggression, who did not hesitate to order the Brest "Deuxième Escadre Légère" to put out to sea and meet the whole German battle fleet, that was supposed at the time to be steaming towards Cherbourg—six 10,000-ton obsolete croiseurs cuirassés against three times as many dreadnoughts of 19,000 tons and over! "Tous les officiers savaient que la Deuxième Escadre serait détruite avant d'avoir tiré un coup de canon." (All officers knew it would be sunk before being in a position to firing a single effective shot.) It must be said that Mons. de Kerguézec is here hitting the right nail well on the head. Success, not mere show of bravery, is what chiefs worthy of the name must aim at. France has sacrificed too much to la glorie, when are remembered the young officers who, in August, 1914, bravely but stupidly led, with white gloves and plumets, their platoons to the attack à la baïonnette of a well-entrenched enemy and amply provided with machine guns, when is remembered the flagship *Suffren* entering the Dardanelles ablaze with exploding shells, with the band playing on the upper deck. "C'est beau, mais ce n'est pas la guerre." Speaking in 1909 of the then poor condition of French artillery, Admiral Touchard affirmed that "les marins Français sauraient mourir avec honneur." Now, to die with honor is certainly a grand thing, but it cannot, unfortunately, redeem past unpreparedness and lack of manly perseverance on the part of nations. To conquer and live on is the better

and more sensible solution, though, of course, neither Frenchmen nor Englishmen could ever manage, however much they may try, to come down to the depth of ignominy of the treacherous Boche, ready to crawl on all fours before his victors to try and escape by deceit and hypocrisy from the consequences of his defeat and crimes.

In Deputé de Kerguezec's eyes an efficient coast defence is the sole raison d'être of the French fleet. He once declared, to the amazement of most officers, that the possession of an adequate submarine fleet would have enabled France to win the war without the help of the British armada. "With 250 submarines around her coasts, France would be in a position to defy all comers." As bona-fide submarines, he only reckons the ten 800-1200-ton boats of the Sané class. "Le cuirassé, dans sa forme actuelle, est périmé." The battleship is totally out of date, the 25,000-ton *Normandies* and the 24,000-ton *Bretagnes* are pure make-believe, only fit to show the flag.

Strange to say, with these extreme views ex-Minister Leygues concurred, and explained to the Chamber that but for the unfortunate accident that threw him out of power he would have made our coasts perfectly safe with big guns to sink those enemy ships bold enough to come within effective range, and with seaplanes and underwater destroyers to go and meet those enemies which shyness might retain at too long a distance from our shores. With such a perfect system there would be no surprises to fear, no need of expensive and vulnerable mastodons. Nothing in the "cheap and nasty" line, but economy and safety. Thus a splendid recipe for Mons. Landry, who for the moment occupies the post recently vacated by Mons. Leygues.

Fortunately for France, these narrow-minded and ill-informed politicians are not to have it all their own way. The submarine fleet so naïvely advocated by Mons. de Kerguezec would be neither economical nor efficient. Coast defence is only a part of sea power. The leading service reviews, *Le Yacht*, and Admiral Degouy in *La Vie Maritime* are denouncing the stupidity which consists in throwing away the benefit of the hundred million francs already expended on the half-completed *Normandies*. The *Ligue Maritime* is issuing a vehement protest against that other folly which resides in devoting State arsenals exclusively to cargo building, and in saddling the navy with the cost of their upkeep and management. A well-known admiral stated the views that obtain in the higher naval circles as to the guiding principles of France's maritime policy. Whilst entertaining no dream of supremacy, the Republic aims at safety and at retaining her position as a great Power with a right to a say in the world's affairs. Superiority over all Continental rivals is the first object, and it cannot be attained through the building of poussiere navale alone. On the other hand, the contest of to-morrow for the command of the water will be between Great Britain and the United States. Not sentiments, but facts, statistics, and interests govern the world. Therefore, France, in addition to a defensive fleet, must have great and fast ocean weapons, at least equal in quality to American and British battleships, that could be thrown into the balance should France's interests require it. A "diplomatic" squadron of six or seven units of the highest size and power, based on Brest, Dakar, and the West Indies and other colonial points d'appui, amply provided with submarine and aerial auxiliaries, would make the French fleet a determining factor at sea.—*The Naval and Military Record*, Mar. 31, 1920.

GREAT BRITAIN

H. M. S. "HOOD."—*Why the Original Design was Altered.*—Sir Eustace d'Eyncourt, Director of Naval Construction, in the course of a most interesting paper on the design and construction of H. M. S. *Hood*, said that vessel completed the series of big ships designed and built for the navy down to the present time. The original design of the *Hood*

was approved by the Board of Admiralty in April, 1916, only a few weeks before the battle of Jutland. That battle, which was "the greatest fleet engagement of modern times," naturally led to further consideration of the vessel's design, and in view of the damage which was done to our own battle-cruisers, and also to the German ships of similar type, it was deemed advisable to increase the armor protection if possible. As the result of very extensive investigations, it was found possible, by accepting a deeper draught and a slightly reduced speed, to add considerably to the protection of the vessel as already designed, without serious modification of the design of the ship as a whole. The alterations, which were of a radical character (as, for instance, the increase of the armor belt from 8 to 12 inches), involved an additional weight of nearly 5000 tons, although the original length and beam of the ship were maintained. It also meant that the time of construction was extended to four years, being about double the time taken to build our recent capital ships, and nearly three times that taken to build the *Repulse* and the *Renown*. It was claimed, however, that the modifications were justified by the circumstances, and the Admiralty had no doubt that they had in the *Hood* a much more powerfully protected ship, although it meant the increase of her displacement by about 50 per cent more than that of the *Repulse* and the *Renown*.—*The Naval and Military Record*, Mar. 31, 1920.

FINEST FIGHTING SHIP.—Admiral of the Fleet Viscount Jellicoe congratulated Sir Eustace d'Eyncourt on having designed "the finest fighting ship in the world." She had exceeded her anticipated speed and had come up to a speed equivalent to that of what were regarded as the lighter and faster ships. He also congratulated the Director of Naval Construction on the courage he had shown in the early days of the war in the adoption of the bulge system of protection. Recently, when he (Admiral Jellicoe) was in the United States, he attended some tank experiments relating to battle-cruisers at the Navy Yard at Washington, and noticed that the bulge protection was carried to the bows. He asked the reason, and was told that the tank experiments showed that carrying the bulge protection so far forward assisted considerably in the matter of speed. He would like to know if that was Sir Eustace d'Eyncourt's view. He would also like to know his reason for the adoption of the smaller type of water-tube boilers. He asked this last question because when he was Controller of the Navy in 1910 Sir Charles Parsons advocated the adoption of that type, but he (Admiral Jellicoe) could get no encouragement from the experts and he had to drop the idea. He was glad to hear what Sir Eustace d'Eyncourt had said on the question of the retention of the capital ship. He was sure that those who were interested in warship designing would read with considerable relief the recent pronouncement of the Board of Admiralty on the subject.

Rear-Adml. Sir Alfred Chatfield said that there was a class of critic who attached undue importance to speed. It was not the experience of those who fought at sea that speed was the determining factor because it enabled those who possessed that advantage to determine their range. In ninety cases out of a hundred the weather determined the range. What they were trying to do now at the Admiralty was to get the naval officer in future to take a larger share of responsibility for the design of our warships. He might say this much with confidence, that if the Director of Naval Construction was going to design a new ship to-day he would not design the *Hood*. But what the new design was going to be was a thing that could not yet be told.

Sir Eustace D'Eyncourt, replying to Adml. Jellicoe's questions, said that since the bulge protection only reduced the speed of the *Hood* a fraction of a knot he did not see any advantage in carrying it to the point of the bows, as long as the vulnerable parts were protected. With regard to the use of the smaller type of water-tube boilers, his experience had been that

they gave 30 per cent more power without any corresponding increase in weight.—*The Naval and Military Record,* Mar. 31, 1920.

VALUE OF THE "BULGE."—Dealing with the latest developments of the "bulge" or under-water protection against torpedoes, which had been embodied in the *Hood,* Sir Eustace observed that "no ship provided with the original or the later form of bulge was lost or even seriously damaged by torpedo attack during the war," and there had not been any loss of life in any such case. Experience and trials had shown that the new *Hood,* as protected, could receive the blows of several torpedoes and still remain in the line without loss of speed. The torpedo protection, it was explained, consisted of the bulge arrangement, with an outer compartment of air and an inner one specially strengthened with the necessary separating bulkheads, etc. This protection extended throughout the whole length of the machinery spaces and magazines, and it could be said that it rendered the ship as safe against attack from torpedoes under water as she is against gun attack above water. As originally designed, with a displacement of 36,300 tons, the *Hood* was to give 32 knots; as subsequently modified, with an added weight of 5000 tons, bringing her displacement up to 41,200 tons, her actual speed, with all her fuel and stores on board (which was considerably in excess of the normal load-draft), was 32.07 knots. The cost of the ship is about £6,000,000.—*The Naval and Military Record,* Mar. 31, 1920.

MIDSHIPMEN IN EXCESS OF NEEDS.—The Secretary of the Admiralty announces that, in view of the surplus of officers resulting from the reduction in the fleet on the termination of the war, it has been decided to give parents or guardians of midshipmen the opportunity of withdrawing their sons or wards from the navy in order to place them in some other walk of life. The resulting reduction should give improved prospects of promotion to the officers who remain. If the withdrawal is made on or before September 15 next, a withdrawal grant of £400 will be made in each case in consideration of any expenses to which parents or guardians may be put in making other arrangements for the future.

Applications for withdrawal will be dealt with in order of receipt, and when the desired reduction has been made no further applications will be considered. The withdrawal grant will not be paid in cases where a midshipman is liable to discharge under the ordinary regulations for unsatisfactory conduct or incapacity, and the Admiralty reserve the right of withholding permission for withdrawals in cases where disciplinary action is pending. The necessary notification has been sent to those concerned.

These arrangements will apply only to midshipmen, R. N., and will not be retrospective. Midshipmen, R. N. R. and R. N. V. R., and paymaster-midshipmen, R. N., are not included.—*The Naval and Military Record,* Mar. 31, 1920.

SUBMERSIBLE OR SURFACE SHIPS.—On the subject of the relative value of submersible or capital ship, Sir Eustace said: "With our present knowledge it would be quite impossible to design a submersible ship which on the same displacement and cost had anything like the fighting qualities on the surface which are possessed by the *Hood.* Every ship is a compromise, and if in addition to the ordinary qualities of a battleship she is required to submerge, or even partially submerge, a very considerable percentage of weight has to be added to give her this additional capability of submergence. . . . . Although there is no doubt that submarines are capable of great development, a little thought will make it clear to anybody that if naval warfare is to continue, the surface ship of the line must still hold the field as the principal fighting unit of any great navy. This view is apparently shared by other countries who are developing their navies, and

both Japan and the United States are building large capital surface ships."—*The Naval and Military Record,* Mar. 31, 1920.

SIX BIG SHIPS NOT REQUIRED.—An announcement relating to the reduction of the fleet was made by Mr. Long, First Lord of the Admiralty, in the House of Commons on Wednesday, when he informed Com. Viscount Curzon that the following ships of the all-big-gun type were not required for the post-war fleet, but the method of their disposal was not yet settled: *Agincourt, Bellerophon, Dreadnought, Superb, Inflexible,* and *Indomitable.* The remainder were all included in the post-war fleet. This decision had not been considered by the Committee of Imperial Defence.—*The Naval and Military Record,* Mar. 31, 1920.

CANADA'S NAVAL POLICY.—Mr. Ballantyne, the Minister of Marine and Fisheries, speaking in the Canadian House of Commons, said that the government has decided to carry on the naval service along pre-war lines, and has accepted an offer by Great Britain of one light cruiser and two torpedo-boat-destroyers to take the place of the present obsolete and useless training ships *Niobe* and *Rainbow.* The Minister, in order to be free thoroughly to reorganize and place the present service upon an economical basis, has issued orders for the demobilization of all officers and naval ratings, and for the discontinuance of civilian help at headquarters and at the naval dockyards at Esquimalt and Halifax. Canadian officers who are in the Imperial fleet and are being paid by the Canadian Government will be recalled and placed on duty with the Canadian service. The Naval College will also be continued. After the reorganization only those officers and other ratings will be taken on who are absolutely necessary and possess the qualifications desired. Mr. Ballantyne also announced the retirement of Admiral Sir Charles Kingsmill, who has been Director of the Naval Service of Canada since 1908. His place will be taken by a senior officer.—*The Army and Navy Gazette,* Apr. 10, 1920.

FUTURE DESIGN.—Before the *Hood* can be passed into the fleet it is claimed that she will be eclipsed by vessels which the United States is building. In the meantime, however, the department entrusted with the designing of warships in this country has not been resting, and it is not unlikely that before the new American mastodons are in commission there will have been designed vessels which will outclass them. Adml. Sir Alfred Chatfield, who took part in the discussion at the meeting of the Institution of Naval Architects, disclosed the interesting fact that at the Admiralty they were trying to get the naval officer in future to take a larger share of responsibility for the design of our warships. Adml. Chatfield, of course, gave no hint as to what the next design is going to be, but he was able to state with confidence that if the Director of Naval Construction was going to design a new ship to-day he would not design the *Hood.* That statement may be regarded as indicating that the designers of British warships are keeping well abreast of their rivals in other countries.—*The Naval and Military Record,* Mar. 31, 1920.

FLEET FLYING.—Naval aviation has enjoyed a large share of public attention in the past week or two. The announcement that a Naval Wing, under the Air Ministry, is to be created, with a personnel specially trained for naval work, has given great satisfaction, for the man in the street had realized that the navy would never be in a position to exploit the possibilities of air power so long as the Air Service was monopolized by military men. Interest in the subject has received a fresh fillip in the news that an aeroplane succeeded in landing on the deck of H. M. S. *Argus* whilst the Atlantic fleet was cruising near Vigo. *The Times* describes it as being the first time that such a feat has been accomplished, but we think

this is wrong. When the *Furious* first joined the fleet as an aircraft-carrier in 1917 many attempts were made by 'planes to land on her deck, and although there were many failures, several accidents, and at least one fatality, it was understood that several landings had in fact been made. It is possible, however, that the difficulties have been overcome to such an extent that 'planes may henceforth alight without serious risk of damage, in which case the aircraft-carriers of the fleet will have a greatly increased value. It needs no undue effort of the imagination to conjure up a picture of future naval warfare in which swarms of aeroplanes, starting from fast aircraft-carriers, will deliver torpedo attacks on an enemy fleet lying behind its supposedly impregnable fortifications, and then return to their parent ship for a fresh supply of "tin fish." Naval flying "stunts" undertaken during the war usually meant the loss of several machines through landing on the water at the close of the operation; but if alighting on the deck of the aircraft-carrier is now becoming a practical proposition there will in future be a much stronger inducement to use these machines both for reconnaissance and offence.—*The Naval and Military Record*, Mar. 31, 1920.

TRANSPORT IN THE NEXT WAR.—Transport is such a wide subject that the mere enumeration of the various methods available to the British Empire in prosecution of warlike measures in our own defence or on behalf of countries over which we exercise a protectorate or mandate would fill a chapter. One thing, however, is certain—apart from *morale*, training and equipment, numbers and leading—the success of practically every war in which we are likely to be engaged will depend on the manner in which we prepare and utilize the system of transport most suited to the locality of the country in which we fight, and link up that system by road, rail, air and sea with our base of operations and the home ports in Great Britain from which our reinforcements and supplies are sent out. It is quite possible to spend very large sums out of the public funds on the wrong kind of transport for a particular expedition and thus handicap the fighting men and those responsible for the supply of food and munitions by delaying transmission and distribution in the field.—*The Army and Navy Gazette*, Apr. 10, 1920.

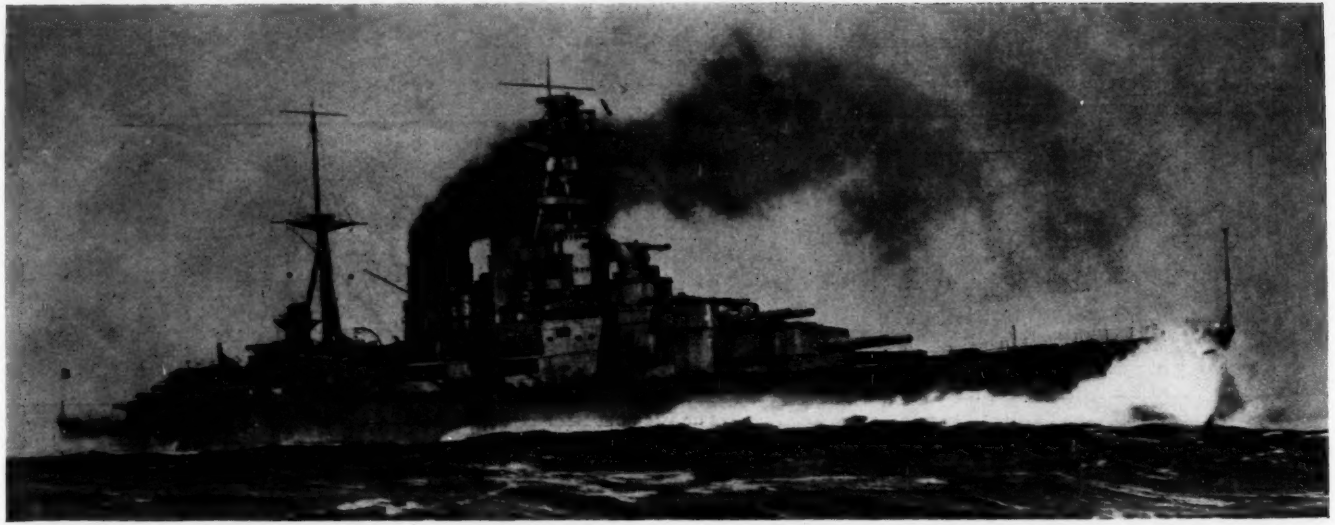
NAVAL COMMAND IN WAR.—Students of naval policy can scarcely fail to recognize in the memoirs of Admiral Reinhold Scheer a similar vein of complaint against the German naval system to that which ran through the pages of the reminiscences of Grand Admiral von Tirpitz. Both these officers endeavor naturally to find excuses for the failure of the weapon which the Naval Secretary of State fashioned, and which was given to the Commander-in-Chief to handle. To some extent they find an excuse for what happened in that the British Admiral did not do what they had expected he would do, and in accordance with which they had made their plans. On the other hand, their most serious grievance is with their own administration, to the failings of which they attribute very largely the non-success of their arms at sea. It would be very mistaken on our part if we did not endeavor to profit by what these German naval writers tell us of the state of affairs in the Fatherland which so materially helped to mold the course of events. Particularly is it necessary that we should do this at the present time, when there has been an agitation in this country to assimilate our methods of administration of the fighting services to something like that which was a primary cause of the German failure.

It may be recalled that in British naval administration before the war the demand was for a more distinct separation of the departments concerned on the one hand with operations and on the other with the provision and maintenance of the material of the fleet—in other words, it was urged that something approaching the constitution of the old Navy Board should

be resorted to. In this demand the great Admiralty Staff of the German Navy was invariably held up as a model to be followed. Advocates of a change insisted that those who controlled the British Navy were too materialistic, too much absorbed in administrative duties, and insufficiently acquainted with the strategical principles governing the use of the fleet and the problems to which their application gave rise. That there was some force in these criticisms may perhaps be admitted in view of the developments in the Naval Staff during the war. The point is, however, that we achieved success in spite of any shortcomings in this direction, whereas in Germany, where Admiral von Tirpitz shows that the dividing line between supply and operations was in theory clearly marked, the reverse was the case.

The Emperor, as War Lord, was in chief command, representing, it might be said, Cabinet government in this country, with such qualification as follows from the individual and personal position of a Kaiser. Next, in a sense, came the Chief of the Naval Cabinet, who advised the Emperor in regard to officers' promotions and appointments, and in a measure corresponded to our Naval Secretary to the First Lord. How this Chief worked in practice may be gathered by von Tirpitz's references to "that curious and somewhat incomprehensible person, von Müller," then Chief of the Cabinet, who had "an excessive share of the responsibility for Germany's fate." The real danger lay in the fact that "if he could not achieve anything, he could at any rate prevent everything." Thirdly, in the German system was the Chief of the Admiralty Staff, the counterpart of the British Chief of the Naval War Staff at the beginning of hostilities. Since the Chief of the Staff, more or less, controlled operations, and the Secretary had been and was responsible for the weapons and ships to be used therein, everything depended on harmony between the two, and this, it is clear, was lacking, for von Tirpitz complains that "the plan of operations was treated by the Naval Staff as secret even from me," and on one occasion, in despair, von Tirpitz offered to place himself wholly under Admiral von Pohl, then Chief of Staff, if only the latter would discuss his decisions with the Secretary of State beforehand. Tirpitz considered von Pohl a good seaman and excellent navigator, who had led a squadron very well, but that this was the limit of his capacity, and he speaks of the great astonishment in the navy when von Pohl was made Commander-in-Chief.

Finally, there was the Naval Secretary of State, who in peace time combined duties analogous to those of the ancient Controller of the Navy and the present First Sea Lord. Grand Admiral von Tirpitz was probably the one man best fitted to direct the naval war, but his voice was drowned by the other departments mentioned, so much so that he declares that the touchiness of the Chief of Staff prevented him from getting into direct communication with Admiral Ingenohl, the Commander of the High Sea Fleet. In addition to all these naval authorities, there was the Imperial Chancellor and the army chiefs, who also had a finger in the pie. The original submarine campaign, for example, was started in 1915 against the wishes of the Admirals because the Chancellor, the Foreign Office, and the Great General Staff had approved, and the Emperor was agreeable; but in 1916, when von Tirpitz would have started the intensive submarine war, it was delayed until a year later. Thus important questions of naval policy were largely determined by those who had little or no sea knowledge or an inadequate appreciation of the fleet's work. Tirpitz concludes—and in this he is supported by Admiral Scheer—that the first cause of the navy's tragic fate was the political obstacles in the way of its active employment, and in the second the lack of a single responsible command by a naval officer. The lesson for ourselves, to whom sea power is much more vital than to Germany, is manifest. Before we launch out into a Ministry of Defence, to which the chiefs of the navy, army and air force will be subsidiary, or subordinate the sea service to a general staff, let us pause



THE BATTLE-CRUISER "HOOD" STEAMING AT FULL POWER OVER THE MEASURED MILE NEAR ARRAN FORTH OF CLYDE ON MARCH 18, 1920.

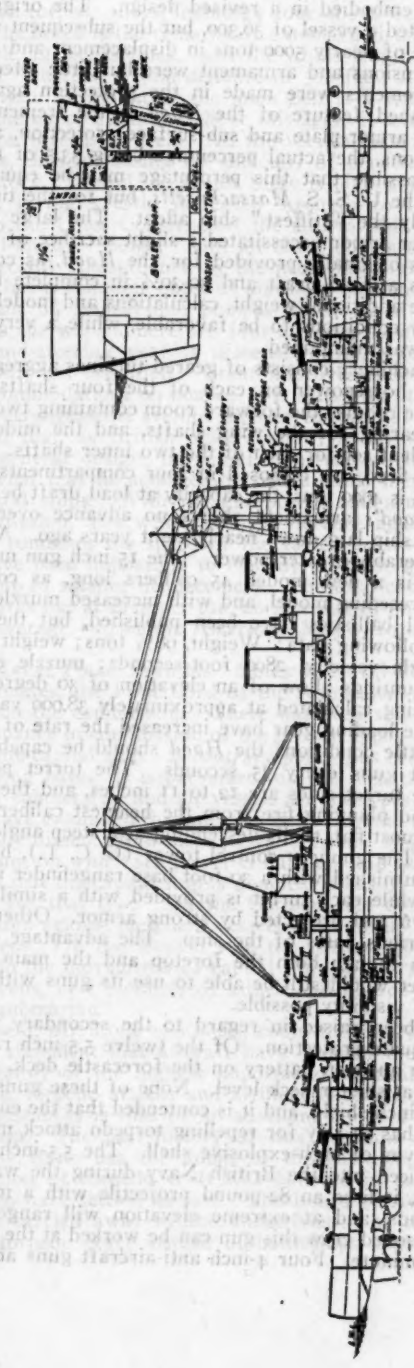
Battleship *Hood*. Length, 860 feet; beam, 104 feet; mean draft, 28½ feet. Mean displacement, 41,200 tons. Speed (contract), 31 knots. Guns: eight 45-caliber, 15-inch; twelve 5.5-inch; four 4-inch anti-aircraft. Armor: belt, 12-inch; gun positions, 12 to 15-inch; total weight of armor, 13,800 tons. Torpedoes: two 21-inch submerged; four 21-inch above water.

and consider whether we may not be in danger of repeating the errors which made the German Navy such a gigantic failure.—*The Army and Navy Gazette*, Apr. 17, 1920.

THE BACKBONE OF NAVAL POWER.—*British Confidence in the Battleship as Exemplified in the Hood.*—"In our opinion the capital ship remains the unit on which sea power is built up. So far from the late war having shown that the capital ship is doomed, it has on the contrary proved the necessity for that type. On the German side the whole of the submarine campaign against merchant vessels was built up on the power of the High Sea Fleet. On the British side the enemy submarines in no way interfered with the movements of capital ships in carrying out operations; destroyer screens, new methods of attack, and altered tactical movements defeated the submarine." The foregoing extracts from a statement of policy issued by the British Admiralty on March 12 clearly indicate the direction of British naval development within the immediate future. Although signed by the First Lord, Mr. Walter Long, the memorandum is known to have been written by Admiral of the Fleet Earl Beatty, with the full concurrence of his professional colleagues on the Board, all of whom held commands afloat for the greater part of the war. *It is a very significant fact that the opponents of the big ship are, practically without exception, retired officers who have had no experience of modern warfare. On the other hand, nine out of every ten officers who served afloat in the late war—from admirals down to sub-lieutenants—are convinced that great armored ships are as essential to the command of the sea as ever they were,* and that their supremacy is still unchallenged, despite the admitted powers, actual and potential, of submarines and aircraft. Nor is this view confined to the British Navy. Both in the United States and Japan, capital ships of the largest dimensions are now building; while Admiral Scheer, late commander of the German High Seas Fleet, states in his recent book that "the big ship—battleship and battle-cruiser—is, and will be, the main strength of naval power." It will be seen, therefore, what little justification exists for the charges of hide-bound conservatism which have been preferred against the British Admiralty on account of its decision to perpetuate the capital ship, rather than trust to underwater and aerial weapons for the defence of the Empire.

One reason why the new British battle-cruiser *Hood* has attracted such universal interest is the widespread popular belief that she is destined to be the last ship of her kind. As I have said, this view finds no support in practical naval circles. It is, of course, very probable that capital ship design will undergo drastic modification in the future, consequent upon improvements in those methods of attack which she has most reason to fear. Engineering progress also is bound to affect the design, and the Diesel-driven, funnelless battleship, with guns possessing an all-round arc of fire, is a conception of the near, rather than of the remote, future. Later still, the battleship may take unto herself the power of diving below the surface; but, as the Admiralty statement observes, "such types are visions of the far future, not practical propositions of the moment." The *Hood* deserves all the attention which has been bestowed upon her, not because she is likely to be the last of her type, but because she most nearly approaches the ideal in capital ship construction according to the tactical doctrines of the present day, and because she is already exerting a marked influence on naval design the world over.

The *Hood*, we recall, was originally to have been laid down in 1915, at which date the British fleet was none too well supplied with battle-cruisers, and Germany was known to be speeding up the completion of *Derfflinger*, *Lützow*, and *Hindenburg*. But since every large building slip in the United Kingdom was then occupied, the contract could not be placed until late in 1916. As it happened the delay was a blessing in disguise, for meanwhile the Battle of Jutland had been fought, and the experience of that engage-



INBOARD PROFILE AND MIDSHIP SECTION, SHOWING GUN AND ARMOR DISTRIBUTION.

ment was promptly embodied in a revised design. The original plans of the *Hood* contemplated a vessel of 36,300, but the subsequent modifications involved an increase of nearly 5000 tons in displacement and of three feet in draft. The dimensions and armament were but little altered, but very considerable improvements were made in the protection against gunfire. A hitherto unpublished feature of the *Hood* is the tremendous weight monopolized by her armor-plate and sub-surface protection, amounting in all to some 13,800 tons, the actual percentage being 33.5 of the total displacement. It is possible that this percentage may be equaled, perhaps even surpassed, in the U. S. S. *Massachusetts,* but for the time being the *Hood* is undoubtedly the "stiffest" ship afloat. The large increment of weight due to thicker armor necessitated a slight sacrifice of speed. Thus in place of 32 knots originally provided for, the *Hood,* as completed, has a speed of 31 knots at load draft and 30-30½ in complete fighting trim. Notwithstanding the additional weight, calculations and model experiments showed the stability conditions to be favorable, while a very satisfactory metacentric height was maintained.

The propelling machinery consists of geared turbines aggregating 144,000 horsepower—36,000 horsepower on each of the four shafts. There are three separate engine rooms; the forward room containing two independent turbine sets and gearing for the wing shafts, and the middle and after rooms one independent set for each of the two inner shafts. The twenty-four boilers, all oil-fired, are disposed in four compartments. The maximum supply of fuel is 4000 tons, the capacity at load draft being 1200 tons.

On paper the *Hood's* armament shows no advance over that of the *Queen Elizabeth,* a ship laid down nearly eight years ago. Actually, however, it is of considerably greater power. The 15-inch gun mounted in the new battle-cruiser is a new model, 45 calibers long, as compared with 42 calibers in the preceding model, and with increased muzzle velocity and energy. No official ballistics have been published, but the new gun is credited with the following data: Weight, 98½ tons; weight of projectile, 1950 pounds; muzzle velocity, 2800 foot-seconds; muzzle energy, 86,700 foot-tons. The mountings allow of an elevation of 30 degrees, the range at this elevation being calculated at approximately 38,000 yards. Various improvements in the loading gear have increased the rate of fire very materially. Under battle conditions the *Hood* should be capable of firing a full salvo of eight guns every 35 seconds. The turret port-plates are 15 inches thick, the turret sides are 12 to 11 inches, and the roof is stout enough to withstand plunging fire from the heaviest calibers. As, moreover, the roof is almost flat, shells descending at a steep angle would probably be deflected. The gunnery control tower (G. C. T.), built above the conning-tower, is furnished with a 30-foot base rangefinder in an armored revolving cupola, while each turret is provided with a similar instrument built into the crown and protected by strong armor. Other rangefinders are mounted in various parts of the ship. The advantage of this duplication is that even though both the foretop and the main control were disabled, each turret would still be able to use its guns with effect at the maximum range of visibility possible.

Criticisms have been raised in regard to the secondary armament, on the score of inadequate protection. Of the twelve 5.5-inch rapid-fire guns, ten are mounted in an open battery on the forecastle deck, the remaining two being situated at shelter-deck level. None of these guns has any protection beyond a 1-inch shield, and it is contended that the entire armament on which the ship has to rely for repelling torpedo attack might be wiped out by the first salvos of high-explosive shell. The 5.5-inch is one of the new marks introduced into the British Navy during the war. Weighing only 6 tons 4 cwt., it fires an 82-pound projectile with a muzzle velocity of 2950 foot-seconds, and at extreme elevation will range up to 12,000 yards. With a seasoned crew this gun can be worked at the rate of twelve aimed rounds per minute. Four 4-inch anti-aircraft guns are mounted on

the shelter-deck aft, and provided with a special control position. There are six 21-inch torpedo tubes, including four above water.

A point to be noted is the remarkably extensive distribution of the armor. The main belt, 12 inches thick, runs the whole length of the side between "A" and "Y" turrets, a total distance of 562 feet, at a uniform depth of 9 feet 6 inches. Surmounting the main belt is a strake of 7-inch armor reaching to the upper deck, and above this again is a layer of 5-inch armor as high as the forecastle deck. All the vertical armor slopes outward at a sharp angle, thus increasing the difficulty of penetration for shells fired at any trajectory. Behind the armor there is plating from 2 inches to 1½ inches thick, giving greatly increased strength to the whole structure. According to the Chief Constructor, the anti-torpedo defence consists of the now well-known "bulge," with an outer compartment of air and an inner one specially strengthened by the necessary division bulk-heads.

The *Hood* has a complete outfit of auxiliary machinery, including a very elaborate plant of submersible pumps, which saved many a ship from foundering in the war. There are four steering positions in the ship, but the usual hand-steering gear is dispensed with, war experience having failed to justify its retention. Great improvements have been made in the living accommodations on board. It is stated that the berthing, cooking and sanitary arrangements are not inferior to those of the latest American warships, and that, as British officers know, is saying a good deal. As regards the general design, the Chief Constructor cites the *Hood* as an example of what may be achieved by substantially increasing the displacement of capital ships. With the gun-power and armor protection of a first-class battleship, and with excellent defence against underwater explosions, she combines the speed of the fastest battle-cruisers. It would, of course, have been impossible to embody all these qualities to the same extent in a ship of smaller displacement. The total cost of the *Hood*, viz.: £6,025,000, works out at £145 per ton, an increase of only 60 per cent above the pre-war average.—*Scientific American*, May 1, 1920.

NOTES ON NAVAL POLICY.—In his "Notes on Naval Policy" which accompany the Estimates, the First Lord of the Admiralty offers some interesting remarks on the capital ship. There has been some criticism, he says, of the maintenance in commission of the present types of vessels, especially in regard to the capital ship. A contrary policy has been openly advocated, this policy being based, it is presumed, on the idea that the battleship is dead and that submersible and air vessels are the types of the future. The Naval Staff have examined this question with extreme care, and as a result they profoundly dissent from these views. In their opinion the capital ship remains the unit on which sea power is built up. So far from the late war having shown that the capital ship is doomed, it has on the contrary proved the necessity for that type. On the German side the whole of the submarine campaign against merchant vessels was built up on the power of the High Sea Fleet. On the British side the enemy submarines in no way interfered with the movements of capital ships in carrying out operations; destroyer screens, new methods of attack and altered tactical movements defeated the submarine.

Nor at present, Mr. Long continues, could the Board of Admiralty subscribe to the statement that aircraft have doomed the capital ship. Aircraft are certainly of the highest importance in naval tactics, as regards reconnaissance, torpedo attacks and artillery observation, but their *rôle* in present circumstances is that of an auxiliary and not of a substitute for the capital ship. The past history of this question must be taken into account; many times has the doom of the battleship been pronounced. The introduction of torpedo craft was believed in certain quarters over 20 years ago to have settled its fate. The Board of Admiralty at the time refused to be carried away by the attractiveness of the idea of building small, cheap torpedo craft instead of battleships, and they proved to be

right. History has shown that the introduction of a type to destroy the capital ship has been quickly followed by the evolution of counter-measures which sustain its power.

They therefore believe, adds the First Lord, that the battleship must remain the principal unit, and that fleet tactics and tactical training must be carried out with the battle squadron as the main unit. Nevertheless, it must be emphasized that, although the battleship remains, its type may require to be altered. Advances in electricity, in the internal-combustion engine and in science generally will inevitably necessitate an eventual change of type, and it is one of the principal functions of the Naval Staff to keep continuous watch on scientific development, with the object of ensuring that the type of capital ship designed meets the requirements of the future. It is even possible that the present battleship will change to one of the semi-submersible type, or even of a flying type, but such types are visions of the far future, not practical propositions of the moment. By gradual evolution and development the types forecasted may arrive, but the immediate abandonment of the capital ship in favor of a visionary scheme of aircraft and submarines, would leave the British nation destitute of sea power and without the means of progressive training.—*The Shipbuilder*, April, 1920.

BRITISH ADMIRALTY DISLIKES USE OF SUBMARINES.—In a recent discussion of naval affairs in the House of Commons, Walter Long, First Lord of the Admiralty, is quoted in a press dispatch from London dated April 4 as saying that the British Admiralty had never concealed its view that the work of the submarine was a horrible form of warfare, and that nothing would give it greater pleasure than to see the use of the submarine in war discontinued. Mr. Long said, however, that he doubted if the adoption of such a policy would be "practical politics," for the reason that the submarine method of defense was very attractive to small but poor countries, which could not afford to keep up costly fleets of battleships and cruisers.—*The Army and Navy Journal*, May 1, 1920.

THE AMERICAN NAVY.—There is no navy in the world which is showing greater activity and development at the present time than that of the United States. A year ago, when Mr. Secretary Daniels was in England, he stated in an interview that "We must follow the example of that great American soldier in the Revolution who advised his soldiers to 'Trust in God and keep your powder dry!'" On many occasions of late the Secretary has given evidence that his policy for the American Navy is based upon this utterance. "We must have," he told the Senate Naval Affairs Committee on Feb. 7, "incomparably the biggest navy in the world." Asked some few days later why the United States should now wish to outstrip the British fleet, when she had never paid attention to such a matter before, the Secretary said that America would not be influenced by any particular nation. In other words, her policy is framed upon her needs in two oceans, or what she honestly believes to be her needs, and in seeking to supply them she bears no ill-will to anybody.

The frank and candid statements of the Secretary, and those associated with him in the Navy Department, are all to the good. If there is one point which, on this side, seems to weaken rather than strengthen his case, it is his endeavor to use the Dominion Navies as an argument in his favor. Replying to a question in the House of Representatives on March 7, he is reported to have said that Britain was encouraging her Colonies to build warships. Any examination of what has been said—nothing has yet been done—in this direction will make it clear to Mr. Daniels that what the Dominions may do in future will be in the nature of a transfer of, and not an addition to, our sea strength. They are, it may be hoped, coming in to share the burden with the Old Country, not to

add a fresh one, but, so far, the matter is simply under consideration, and cannot possibly be held to justify additions to the American Navy.

It is timely to point out that, under the 1916 program, which was described as "the first far-reaching constructive naval program in the history of the Republic," 18 capital ships, of which one-third are battle-cruisers and two-thirds battleships, are building or authorized. With 17 existing dreadnoughts and at least 12 pre-dreadnoughts, there will be 47 capital ships in existence in 1925. The important point about the dreadnought fleet of 35 units will be that 16 ships—nearly one-half—will mount 16-inch guns, while another 11 will carry 14-inch guns. There is apparently no immediate intention to scrap the older vessels—either the 12-inch gunned dreadnoughts or the pre-dreadnought battleships and cruisers. According to the evidence of Rear Admiral Taylor, of the Bureau of Construction and Repair, before the House of Representatives Naval Committee on January 31, the peace strength during the year which begins in July next will include 13 pre-dreadnoughts. As regards relative strength, the 16 American ships, mounting the heaviest caliber of gun, should be sufficient to ensure for the United States Navy the first position in the fleets of the world in 1925, provided, of course, that no new program for the British Navy is completed meanwhile. We have only the 10 *Royal Sovereigns* and *Queen Elizabeths* and the *Hood* to compare with them, for the two *Renowns* will be no match for the later, heavier, and better-armed *Lexingtons*. Moreover, the figures for America are exclusive of the additional three ships—two battleships and a battle-cruiser—which the General Board proposed for the 1921 program, but which the House of Representatives last week rejected.

An expanded fleet demands an augmented personnel, and as compared with an enlisted personnel in the navy and marines of 67,644 in 1914, the present authorized strength is 170,000. On June 5 last, Mr. Daniels informed the House Naval Committee that the navy "would be greatly crippled if its personnel were reduced to 150,000." A new asset exists in the 400,000 men who were called up for war service and who, by reason of their training, constitute a splendid reserve which could be drawn upon in an emergency. The Secretary is alive to the necessity of increasing the pay of the enlisted personnel, and he will doubtless continue to pursue his ideal of making the navy a great training institution so that men on leaving it are better equipped for civil life. The ardor with which he favored "uplift" seems to have brought him into conflict with certain senior officers when the war broke out. Thus Rear Admiral Bradley A. Fiske, in his new book, says that in August, 1914, most of the American fleet, instead of being sent north and got ready, was kept in Mexican waters, and "the Secretary was carrying out as an important project, not the preparation of the fleet, but the establishment of an elaborate system for educating the enlisted man."

As with personnel, so with material and establishments on shore for fleet maintenance. An option has been secured by the Navy Department on 5000 acres of land at Alameda, on San Francisco Bay, for a new base for the Pacific fleet, where great yards and docks can be provided. Having sent a fleet of more than half a million tons into the Pacific, "it would be a mistake, almost a crime," says the Secretary, to limit its facilities for docking and repair. Another sign of progress is the attention given to research and experimental effort. The good work which can be done in this direction was indicated by the Inventions Board, presided over by Mr. Edison. Even more remarkable is the program for the development of the Naval Air Service. The large British airship, *R 38*, has been purchased for the American Navy, and seaplanes are being built to attempt a flight across the Pacific. In recent appeal to Congress for a liberal appropriation for naval air work, the Secretary laid particular stress on the

importance of the proper development of naval aviation at the present time, and declared that provisions in this direction could not be postponed.—*The Army and Navy Gazette,* Mar. 29, 1920.

JAPAN

NEW JAPANESE BATTLESHIP.—The keel of the battleship *Tosa* for the Japanese Navy has been laid at Nagasaki. The vessel will have a displacement of 40,000 tons. Her main battery will consist of eight or ten 16-inch guns, and she will be among the most powerful battleships in the world, embodying all essential improvements developed during the World War. Her motive power will be geared turbines, and her designed horsepower, it is estimated, will be sufficient to develop a speed of 24 knots. She was provided for by the 1918 construction program, which included three other vessels of her class, but it is not certain that these will all be of uniform design.—*Army and Navy Journal,* May 1, 1920.

JAPAN'S POLICY IN SIBERIA.—Reuter's Agency has received communication of the following from the Japanese Embassy, explaining the position of the Japanese Government towards the present situation in Siberia:

"Having regard to the fact that Japan despatched her troops to Siberia for the purpose of rendering assistance to the Czecho-Slovak troops, it may be taken that her troops are to be withdrawn, as was clearly stated in the declaration made on the occasion of their despatch, upon the completion of the evacuation of the Czecho-Slovak forces from Siberia.

"From a geographical point of view, however, Japan occupies a position in Siberia altogether distinct from that of the other Powers. More particularly, the political situation now obtaining in Eastern Siberia is not only gravely affecting the state of affairs in Korea and Manchuria, but is far from affording any assurance of the safety of the lives and property of a large number of Japanese subjects in these regions.

"This is the sole cause of Japan's inability to effect the immediate withdrawal of her troops, no design whatever of a political nature being entertained in this connection. Expression is therefore given to the sincere desire of Japan to withdraw her troops as soon as possible after the completion of the Czecho-Slovak evacuation, and as soon as the political situation in the districts bordering on her frontier becomes sufficiently settled to remove all apprehension of danger to the regions of Korea and Manchuria, and to assure the safety of the lives and property of Japanese residents as well as freedom of traffic."—*The Naval and Military Record,* Apr. 7, 1920.

JAPANESE NAVAL RADIO EXPANSION.—It has been reported that the estimates for radio expansion in the Japanese budget for the coming year do not cover the overhauling of the Funabashi station, which must soon be done, as the apparatus is of the old German one-mast type, but only provides for the replacement of the sending and receiving outfits. This is one of the three stations belonging to the Japanese Navy, the others being Hozan (Formosa) and the station at Sasebo, now in course of construction. It is anticipated that the navy will present a supplementary estimate to cover the construction and repair program considered necessary.—*Scientific American,* May 1, 1920.

THE NAVAL PROGRAM AND THE SHIPBUILDING WORLD.—Of late, the Minister of the Navy has invited the leading members of the shipbuilding community to his official residence and has held unreserved consultation with them about the building of war vessels and transports, in the event of the passage by the House, of the Naval Expansion Bill, to be laid before the Diet in its coming Special Session. Though particulars are not known yet, it seems very probable that, speaking roughly, orders for battleships,

cruisers and torpedo-boat destroyers will be placed with the Kawasaki and Mitsubishi Shipyards, while those for transports will go to the Uraga, Yokohama, and Osaka Iron Works. The number of vessels is yet undecided. But at least five or six battleships of the *Satsuma* class will be newly built; for the age of a battleship is reduced at a progressive rate every five years, and the dreadnoughts have already reached their time of replacement. Numerous will be the cruisers and torpedo-boat destroyers to be constructed in consequence of that. The transports are expected to reach the number of thirty or forty, being of the 10,000-ton class. The required material is to be supplied by the government, which will order the iron plates, castings, and the like to be furnished by the Yawata Iron Foundry and the Mitsubishi Company's Kenjiro Iron Foundry. But the boilers and other appurtenances are to be provided by the shipbuilders themselves. At present, our shipbuilding world is busy with executing old orders—the boats are already on the stocks. But, to its great uneasiness, new orders are scarce in consequence of the inactivity of maritime traffic. Therefore, the placing of orders by the government with private builders will serve to disburden them of the worry for keeping their workmen in employ on and after next year. Nay, more than that, the business of the large shipyards will leave much work for smaller ones. So the shipbuilding world may, we think, regain its former activity.—*Osaka Mainichi*, Mar. 27, 1920.

JAPANESE ATTEMPT EIGHTEEN-INCH GUN MANUFACTURE.—IMPROVED ARMOR PLATE.—Following the progress of the naval development of the great powers of the world, Japan is endeavoring to build bigger ships and bigger guns. Already the 16-inch gun has been adopted, but now the necessity for a larger gun presents itself, and the Kure Arsenal is now constructing an 18-inch gun, which will be completed in this coming April. The trial of the gun will be made by technical experts from among the Naval Ordnance officers. Besides this, a new kind of armor plate, with a large portion of copper will be put on the new warships. Hitherto, when the armor was hit, besides the hole made by the shell there were large cracks made around the place hit. It is said that when the new armor is hit, there will only be the hole made by the shell, the copper preventing any cracks.—*Yorozu*, Feb. 26, 1920.

EX-GERMAN ISLES IN PACIFIC.—Regarding the European reports that Japan has fortified former German islands in the Pacific, Mr. Shidebara, the Japanese Ambassador, declares that Japan is adhering strictly to the Peace Treaty, under which such fortification would be impossible.—*The Naval and Military Record*, Apr. 7, 1920.

JAPANESE AIRPLANE ENGINES.—Nagoya is destined to become the center of Japanese aviation, according to a translation from the *Osaka Mainichi Shimbun*. The army machine works, now under construction at Chikusa, a suburb of Nagoya, will be partially completed and in operation, it is expected, by the beginning of this month, at which time the Atsuta airplane factory will be removed to the same place. In this factory seven powerful motors of the Salmson type are under construction, which, while nominally of 230 horsepower, actually develop 250 horsepower. The material used is wholly Japanese, and the results of tests are reported to be most satisfactory.—*Scientific American*, May 1, 1920.

JAPAN'S POLICY IN ASIA.—We have no interest in criticizing Japanese policy but every interest in understanding it. If Japan has made a mistake in Siberia she and not her foreign critics will eventually have to pay the penalty. If her stroke conduces to her greatness and prosperity we shall rejoice with her. Apart from morals or results the recent action in

Siberia has a very direct bearing on two questions which are often asked regarding Japan. The first is: By whom is Japan governed, and the second is: What is Japan's policy in Asia?

The War Office explanation of the seizure of the Siberian towns is that while negotiations were proceeding between the Japanese and Russian commanders, Russian soldiers got out of hand and attacked the Japanese. This may explain Vladivostok, but it does not explain the simultaneous and prearranged attack on the Russian troops throughout the Maritime Province which has resulted, as our correspondent reports to-day, in their practically complete disarmament. It is notoriously easy to create incidents of the kind required to justify a military coup when such a coup has been determined on for other reasons. A commander whose troops are likely to have trouble with other armed forces stationed in the neighborhood will therefore take special measures to prevent clashes, and though he cannot always succeed he will not allow sporadic outbreaks to deflect his policy. This line of conduct would have been in keeping with the declarations of Japanese policy in Siberia which have been made from time to time by the Imperial Government. Contrast with it the actual occurrences.

Neutral eye witnesses, including our correspondent who has now spent four years in the Far East, almost equally divided between Japan and Siberia and who is well qualified to form a reliable opinion, state that there is no evidence of provocation by Russians. American business men who were present bring the same report. This account of the Russian attitude is confirmed by an order issued by the Zemstvo on 30 March ordering Russian soldiers to "avoid all conflicts and maintain friendly relations with the Japanese." But even if we set aside everything except the official Japanese communiques we find nothing that appears to justify the measures taken. The drastic demands of General Takayanagi were conceded by the Russian commander. Their effect would have been to give the Japanese General every facility he required. In spite of Russian compliance with those stringent demands, the unauthorized attacks of some Russian groups were made the pretext of a concerted military operation in the course of which all the Russian forces in the district were attacked by Japanese and disarmed after a day or two's fighting. In other words, the Maritime Province has been taken possession of by the Japanese Army. Even if we accept without question or discount the Japanese commander's account of the Vladivostok incident it forms no sort of justification for this action. The seizure of a province is not the only or even the usual way in which the scuffles of insubordinate soldiers are punished. The Japanese military coup can only be explained on the assumption that it was a predetermined step in the execution of a deliberate policy. The time selected for the event will be noted. It came after the Americans had evacuated Siberia and before the Soviet's peace proposals had been answered.

The action in Siberia seems to answer the questions asked at the beginning of this article. As to the first—"Who governs Japan?"—the general opinion of the public is fresh in the minds of readers. This opinion, expressed by individuals who have every right to be regarded as well informed and repeated by the press almost without exception, is that the move in Siberia was made by the army without the knowledge of and contrary to the wishes of the Cabinet. The Tokyo Asahi put that view very plainly on Saturday when it asked if the Foreign Office still existed and whether the Foreign Minister was well. The military occupation of the Maritime Province is meaningless if Mr. Hara's oft repeated formula that Japan has no territorial or political ambitions in Siberia has meaning. The policy of which it forms part is apparently contrary to the policy advocated by Mr. Matsudaira and favored by the Cabinet. For weeks

the whole press of the country has been urging withdrawal; exactly the opposite policy is followed. The Diet asked questions and a large number of members were opposed to a continuance of Japanese intervention. The Diet was dissolved at a convenient session. A week or two ago one of the Japanese papers quoted Mr. J. O. P. Bland as having suggested that if the Anglo-Japanese Alliance were to be renewed the British Government had better find out whether the army or the Cabinet governed Japan as it was desirable that agreements of that kind should be made with the real government. What does the Siberian coup demonstrate if not that the army has the decisive word? The world has seen that a policy which is opposed by every element in the nation, including the Cabinet itself, and supported by the army is the policy the Empire adopts.

As to the second question, foreign countries will see in the recent action in Siberia a definite step in the direction in which Japan's policy, or destiny, has moved since the China War. Japan then laid claim to a foothold on the mainland which she was obliged to abandon on the pressure of powers who lost no time in grabbing territory themselves. The Russian War followed, and the next long steps were the Liaotung Peninsula and Korea, and South Manchuria. Great steps were made possible by the world war—Kiaochou and Shantung. And now Vladivostok and the Maritime Province. Supplement history with the map and it is seen that from the Gulf of Pechili northward to the Arctic Ocean every gateway to Eastern Asia is in Japanese hands. The British Empire is said to have been in a fit of absent-mindedness, a saying which means that territorial possessions often fell to England when she was looking for something else. But there was nothing absent-minded about General Takayanagi's move in Siberia. It is not explained by the circumstances in which it was made nor by the official reasons. It is contrary to the public opinion of Japan, so far as it has found expression, and it appears to conflict with the views of the Cabinet. What does it show to the world but that matters of national policy are not decided by the opinion of the public or the will of the Cabinet, and that Japan pursues a policy in Eastern Asia of which the course is marked by the successive acquisition of the gateways of the continent?—*Japan Advertiser*, Apr. 13, 1920.

UNITED STATES

NAVAL POLICY

UNITED STATES AND THE PACIFIC.—There is a world of significance in the extracts from *The Army and Navy Register*, of Washington. This journal is not by any means a sensational organ, yet it refers to the Pacific situation as "dire and ominous," and plainly hints that the recent concentration of naval force on the Pacific coast is a counter-move to "the activities and ambitions of Japan." Comparatively little has been heard in England about such activities on the part of our Far Eastern Ally, but it is possible that the American press is kept more closely informed of events in Japan. Be this as it may, a service journal of high standing has now made candid avowal that the rapid expansion of the United States fleet is primarily influenced by the growth of Japanese sea power. Superficially there is no particular cause for antagonism between the two countries, separated as they are by many thousand miles of ocean. Nevertheless, many people in both countries—and not merely the hot-heads—look upon war as a possible, even probable, event within the next few years. China is the principal bone of contention, as was revealed by some strangely intemperate speeches in the United States Senate during the Peace Treaty debate. The Americans have always regarded China as a country of immense commercial possibilities, in which they are determined to have a large share, and they bitterly resent the policy of penetration which Japan has been following

NAVY DEPARTMENT—BUREAU OF CONSTRUCTION AND REPAIR

VESSELS UNDER CONSTRUCTION, UNITED STATES NAVY—DEGREE OF COMPLETION, AS REPORTED APRIL 30, 1920

Type, number and name	Contractor	Per cent of completion			
		May 1, 1920		Apr. 1, 1920	
		Total	On ship	Total	On ship
Battleships					
44 California	Mare Island Navy Yard	91.8	88.	91.	86.4
45 Colorado	New York S. B. Cpn.	46.9	34.5	44.7	30.6
46 Maryland	Newport News S. B. & D. D. Co.	72.	68.	69.	64.
47 Washington	New York S. B. Cpn.	44.4	30.8	43.1	28.2
48 West Virginia	Newport News S. B. & D. D. Co.	28.	9.	27.	7.4
49 South Dakota	New York Navy Yard	10.5	3.	9.4	1.9
50 Indiana	New York Navy Yard	9.7	2.2	9.4	1.9
51 Montana	Mare Island Navy Yard	8.6	1.6	7.8	1.
52 North Carolina	Norfolk Navy Yard	9.7	3.9	7.8	2.1
53 Iowa	Newport News S. B. & D. D. Co.	2.9	....	2.5	....
54 Massachusetts	Beth. S. B. Cpn. (Fore River)	....	...	....	....
Battle Cruisers					
1 Lexington	Beth. S. B. Cpn. (Fore River)	.4	....	.2	....
2 Constellation	Newport News S. B. & D. D. Co.	.4	....	.2	....
3 Saratoga	New York S. B. Cpn.	.5	.2	.3	.2
4 Ranger	Newport News S. B. & D. D. Co.	.4	....	.2	....
5 Constitution	Phila. Navy Yard	.4	....	.2	....
6 United States	Phila. Navy Yard	.4	....	.2	....
Scout Cruisers					
4	Todd D. D. & Const. Cpn.	48.3	30.4	46.3	26.4
5	Todd D. D. & Const. Cpn.	42.1	21.1	39.	16.7
6	Todd D. D. & Const. Cpn.	29.4	2.8	29.2	2.6
7	Beth. S. B. Cpn. (Fore River)	9.3	2.5	5.1	2.4
8	Beth. S. B. Cpn. (Fore River)	5.3	2.5	5.1	2.4
9	Wm. Cramp & Sons Co.	38.	....	35.	....
10	Wm. Cramp & Sons Co.	33.	....	30.	....
11	Wm. Cramp & Sons Co.	17.	....	16.	....
12	Wm. Cramp & Sons Co.	17.	....	16.	....
13	Wm. Cramp & Sons Co.	17.	....	16.	....
Miscellaneous					
Fuel Ship No. 17, Neches	Boston Navy Yard	71.	68.9	64.8	61.3
Fuel Ship No. 18, Pecos	Boston Navy Yard	21.2	13.4	25.8	9.
Gunboat No. 21, Asheville	Charleston Navy Yard	99.5	99.	99.	98.5
Gunboat No. 22, Asheville	Charleston Navy Yard	37.9	28.9	29.8	24.8
Hospital Ship No. 1, Relief	Phila. Navy Yard	81.5	77.5	77.5	73.5
Amm. Ship No. 1, Pyro	Puget Sound Navy Yard	99.5	98.8	99.4	98.5
Amm. Ship No. 2, Nitro	Puget Sound Navy Yard	96.	91.	94.	87.
Rep. Ship No. 1, Medusa	Puget Sound Navy Yard	38.	30.	32	21.
Destroyer Tender No. 3, Dobbin	Phila. Navy Yard	17.9	15.	14.9	12.
Dest. Tender No. 4, Whitney	Boston Navy Yard	....	....	....	....
Sub. Tender No. 3, Holland	Puget Sound Navy Yard	....	....	....	....

There are in addition to the above 85 destroyers, 53 submarines, 6 seagoing tugs and 5 oil tankers in various stages of construction.

There were completed and delivered to the Navy Department during the month of April 8 destroyers.

There are 12 destroyers, 7 submarines and 1 transport (No. 2) authorized but not under construction or contract.

in the Celestial Empire for the past 25 years. Japan, on her side, denies the right of America to interfere, and claims for herself a privileged position in regard to the development of China by virtue of her racial and geographical affinities. A minor, but scarcely less dangerous, source of friction exists in the attitude of the American Government towards Japanese immigration. Japan has never abandoned her standpoint that there should be complete equality of treatment in this matter, though of late years she has found it convenient temporarily to waive the right of her nationals to settle on American soil. At any moment, however, this question may crop up again in a more acute form. Years ago there was some talk in Japan of expelling all American citizens if the Washington Government persisted in denying Japanese immigrants domiciliary rights in the United States. It goes without saying that the execution of this threat would almost inevitably lead to war. It remains to be seen how Japanese opinion will construe the new American policy of permanently stationing a big fleet in the Pacific and creating a chain of naval bases along the coast. In recent years the Japanese Navy has been considerably reinforced, and many new ships are now building, but the United States has still a very large margin of superiority, and seems determined to maintain it.—*The Naval and Military Record*, Apr. 14, 1920.

RESPONSIBILITY OF THE UNITED STATES.—In writing last week of the awkward situation produced in Europe by the rejection in America of the Treaty which her President had so large a hand in framing, we were showing what an American had to say in defence. We saw that this may excuse our man in the street from knowing the American Constitution, but cannot excuse our statesmen. These should have known that the American Senate can only do its share of treaty making by amending, when it thinks fit, the draft document laid before it by the President. Having made amendments by a bare majority, it can force its will on the President, unless he can by an effort win back a majority. Then the foreign Power, receiving the amendments officially, can make fresh propositions. In the present case the amendments or reservations produced such a tangle through Wilson's hard tenacity that it became a question of the whole Treaty which, requiring a two-thirds majority, was lost.

Now, as a strictly legal matter all of this is perhaps correct enough, but—does it not leave a very unpleasant impression? It seems to us to smack somehow of Wall Street and of the wheat pit at Chicago, when the world was looking for a continuance of the sentiment of comrades in arms. The change from this last to the letter of the law has been too rapid for the old-fashioned folk of Europe; we have heard it ascribed to the injured feelings of those across the Atlantic, who think we here have not only sufficiently acknowledged that we owe not only victory, but salvation from utter defeat, to the new soldiers from across the Atlantic.

Would it have been a good thing for us if U. S. A. had ratified the Treaty with the reservations, we having acquiesced in these, and thus put the U. S. A. in a privileged position? Or is it better for us on this side to adhere to the full Treaty, and leave the States outside both of it and of the League of Nations?

The reservations all profess to have for their aim the safeguarding of the sovereignty of the United States over every dollar and every fighting unit that belongs to it. If, then, the States were in with us, but under the reservations, its action in every emergency would depend on the Congress of the moment; that is, membership of the League and association as co-signatory of the Treaty would be a mere pretence. Lord Grey wrote that without the States the League would be hardly more than a League of the Allies, for their own armed defence against a resurrection of Prussian militarism or a military sequel to Russian bolshevism. Bolshevism is despotism, and this has always a tendency to become militarism. Without the United States, Lord Grey thought, the League would have neither the

crushing physical force nor the moral force it would have had, and the old state of things will reappear—that is, a fresh attempt at balance.

"The force it would have had"—but would it have such force, with the U. S. A. in reservations? We more than doubt it, and should prefer to have the reservationers outside. There is no proper room within a league or society for a member who is only to be bound by some of the rules, and can obey or neglect the others according to the whim of the moment. Each member of a society such as the League of Nations is meant to be must hold himself in a position analogous to that of an enlisted soldier who has taken an oath of fealty. If a captain needs a hundred men for war, how many would he have to entertain if some or all of them made reservations that enabled them to consider each proposed fight on its merits? He could never be sure he had a sufficient peace establishment. In the same way, we and France, not sure of the States, would yet—so hard are times—be inclined to run the risk of not being strong enough, under the influence of the general impression that surely the United States would behave decently. Or, and this applies to France in particular, we should strain our resources, for the benefit of naval and military strength, to an extent that might compromise gravely the life of our peoples.

There is, according to some people's views, a growing feeling in America that if the States comes into the League of Nations it will have at once to push for a serious revision of the Treaty of Versailles. It is not easy to see the reason for this opinion, unless the holders of it think the present terms so severe that Germany will, under their burden, be kept indefinitely in the doleful position of the undischarged bankrupt, while they in the States wish to get to full trading with her as soon as possible. Some of them, too, think Great Britain is getting too much out of the war and France too little. Nevertheless, very few indeed of them contemplate direct American help to France, but only through taking something from us. In fact, many of those who in America would have the States join the League argue that the Treaty has been already so modified in practice—for instance, in matters of military effectives, supply of coal, handling over of the culprits—that it must be torn up and a fresh start made; everyone must begin by handing back the things that have been allotted to them and a fresh distribution be made!

It is conceivable that Britain, France, Belgium and Italy might agree, if sufficient American pecuniary aid were forthcoming as a set-off—if, in fact, America paid indirectly a good lump of Germany's just debt. But those who know the quality of American financiers will tell you there is more chance of the sky falling; and when it is a matter of paying out many millions, it is the financier who rules in New York.

On the whole, in the matter of the League, the U. S. A. should either come back to President Wilson and the Paris Conference, and enter the League therefore, or stay out and have no further say in European politics. We shall then know what forces we need to entertain against the risk of renewal of Prussianism and of the spreading of militant Bolshevism.—*The Army and Navy Gazette*, Apr. 10, 1920.

THE PANAMA CANAL.—The announcement recently made from Washington that, in consequence of a caving-in of the banks of the Panama Canal, vessels of deep draft would not be able for several days to pass through, was particularly interesting in view of the voyage of the *Renown*, which, had she not been detained in England by the influenza outbreak, might have been delayed on reaching the Canal. Thanks to the prompt and energetic measures taken, however, the landslide in the Culebra Cut seems to have stopped the passage of ships for only four to five days, but it would appear that movements of the banks in this portion of the canal are likely to recur, and the best that can be hoped for is that the consistent dredging

will make the delays as short as possible, and in any case not more than a few days. Yet the uncertain element is significant. A stoppage of the Canal route might have a profound influence on the naval strategy of the United States, particularly now that she has divided her fleet between the two oceans. One of the main reasons for the despatch of a battle fleet to the Pacific last year was that, although it incurred a strategic risk by dividing the forces available, yet this could be overcome in case of emergency within a few hours by means of the passage through the Canal. There is an interesting passage in Sir Julian Corbett's new History of the Naval War, in which he refers to the possibility that Admiral von Spee might have come through the Panama Canal. He could quite legally have done this, of course, as by the rules which governed its international status it was permitted for three warships of any one nation to pass through at one time, while three others, even of the same nation, could wait at either end. It was therefore possible for Admiral von Spee to take his squadron through without seriously breaking his concentration. As it happened, the existence of the canal does not seem to have affected the naval operations of the war, but it is pretty certain to play a large part in any conflict of the future in the Pacific.—*The Army and Navy Gazette*, Apr. 3, 1920.

THE COMPLETED NAVY.—By 1923 the United States will be at least on equal terms on the sea with Great Britain. This statement is made on the assumption that Great Britain will continue its present policy of marking time in naval construction, and that Congress carries out the three-year naval program of 1916, enacts adequate personnel legislation, and develops the war emergency fleet into a strong merchant marine.

There is no occasion for startling the world with the adoption of a larger naval policy, as was urged by Secretary Daniels in his recent hearing before the House Committee on Naval Affairs and again a few days ago in executive session of the Senate committee. A careful study of the navies of the world and the plans of the great powers makes it clear that Secretary Daniels' declarations were for political purposes only. On two occasions he went before the House committee and insisted that if the United States did not join the League of Nations on the terms submitted by the President, it would be necessary for the nation to enter upon a second three-year program. Curiously enough, in both instances the Senate was about to vote on the Versailles treaty and it was apparent that the Secretary's attitude on the building program for the navy was taken for the purpose of influencing the action of the Senate.

Our supremacy or equality on the sea will not be the result of a new policy on the part of the naval authorities or of Congress. It will really not be of our seeking. The control of the sea will be thrust upon us. We will not be building in an unfriendly spirit towards Great Britain or any other country. We will be simply carrying out a policy that was adopted before the war. Moreover, our three-year naval program has progressed to a point where it cannot be abandoned without great loss to the government and the demoralization of the shipbuilding interests. All of the ships have been contracted for or are in the process of construction in the government yards. The cancellation of the government's obligations under the contracts and the turning back of material already purchased would prove a serious blow to the business of the country.

On the other hand, Great Britain and other European nations were forced to abandon their naval programs on account of the great financial burdens which they are carrying as the result of the war. When the armistice was signed, Great Britain had under construction 1003 ships. Since that time, she has cancelled contracts for 611 ships. Included in this list were three of the *Hood* class. One of the *Hood* class was on the stocks, and

was completed. At present, Great Britain is building no capital ships. France has cancelled contracts for four super-dreadnoughts of the *Flanders* type. The building program for both England and France consists of auxiliary ships and submarines.

Japan is the only nation aside from the United States which is continuing the construction of capital ships. She has now four dreadnoughts building and four more authorized. Japan has really increased her naval program since the signing of the armistice, while the United States is only carrying out a program which was authorized and building before the war was declared. But even with her increases Japan is not yet threatening the supremacy of the United States on the Pacific Ocean. The United States can divide its navy between the Atlantic and the Pacific and still have a stronger fleet in the western waters than Japan. All that the United States will be required to do is to carry out the three-year program, and round out the fleet with the necessary auxiliaries.

The developments of the war have in no way shaken the accepted doctrine by all naval authorities that the battleship or capital ship is the backbone of a navy. In an army, a fighting force is built around the infantry. In a navy, it must be framed around the battleships or the ships that carry the big guns. The control of the sea in the final test rests upon the superiority of the battleship fleet. The development of the submarine has in no way usurped the functions of the battleship fleet. Neither does the prospective development of aeronautics threaten the supremacy of the battleship. Both the submarine and the aeroplane are being fitted into the organization of the fleet as auxiliaries by naval strategists. This is not said in an effort to detract from the importance of equipping the fleet with an adequate force of submarines and aeroplanes.

In discussing the comparative strength of the American Navy with the other navies of the world, there may be some debatable questions, but the present prospects are that its battleship tonnage will be greater than any other force when the three-year program is completed. The only advantage that Great Britain will have will be in the number of dreadnoughts. The strength of both fleets in super-dreadnoughts will be the same, each having twenty-three, but Great Britain will have ten dreadnoughts, while the American Navy will have seven of this class. The strength of the British Navy in both classes of battleships will be thirty-three, as compared with thirty for the American Navy. That this is not considered a vital element in sea-power strength is indicated by the fact that neither the United States nor Japan is building dreadnoughts. It is a general agreement among the authorities that battleships should be either of the superdreadnought type with heavy armor, or battle cruisers with little armor and great speed.

It is in tonnage and caliber of guns that the American fleet will show its superiority. The tonnage of Great Britain's super-dreadnoughts at present is 603,750, while that of the United States is 319,300. But by 1923, when the three-year program is completed, there will be added to the American pre-dreadnought tonnage 451,200 tons, which will bring it up to 770,500 tons, or 166,750 tons in excess of the strength of the British Navy. If the dreadnoughts are taken into consideration, there is not a very great difference between the tonnage of the two nations, The British Navy has a tonnage of 172,100 in the dreadnought class, while the American Navy has only 115,650 tons in this class.

However, there will be a superiority in the American battleship fleet which is not shown in the tonnage. Ten of the American battleships will be armed with 16-inch guns. Beginning with the *Maryland*, which was launched recently, all of the American super-dreadnoughts will carry 16-inch guns, which is a larger caliber than any in the British fleet. Both

the American battleships and battle cuisers will be faster than the English ships and will be of more modern construction. Many of the lessons of the Great War will be incorporated into the construction of the new ships. Unless Great Britain resumes her naval program in the next two years, there is no doubt that the American Navy will have a stronger battleship fleet around which it can build its sea force.

"With the completion of the three-year program," said Representative Fred A. Britten, member of the House Committee on Naval Affairs and an advocate of a large navy, "we will have the strongest navy afloat. It will be our modern dreadnoughts with their superior gun power which will give us the control of the seas. Our navy will be strong in the decisive factors of a sea power. It will have the punch which will be recognized as the dominating power of the sea.

"We should now give our attention to the rounding out of the fleet, the development of the merchant marine and the securing of an adequate and well-trained personnel. As far as I am concerned personally, I am going to start the fight immediately. I have been appointed a member of the conference committee on the personnel bill, and I think that the first step in securing men for the ships will be some legislation for an increase in the pay for officers and men. We cannot afford to temporize in this matter any more than to abandon the naval program which we adopted before the war. Without the men to man them, our ships will be useless and our navy weak."

Japan, with its feverish haste to build up a navy, can scarcely put a battleship fleet in the water half the strength of that of the United States by 1923. Taking into consideration the super-dreadnoughts that Japan has built, building and projected, she would have a naval program of 403,500 tons, or a little over one-half the strength of the American fleet, which under the three-year program would be 770,500. But the real comparison should be the tonnage built and building. She has now four super-dreadnoughts with a tonnage of 123,600 and is building four more with a tonnage of 128,000, which will give her a total of 251,600. If the United States were to provide its battleship tonnage equally between the Atlantic and the Pacific, it would have a tonnage of 385,250 with which to meet Japan's battleship fleet of 251,600. The only ship that Japan has in the dreadnought class is one with a tonnage of 21,400, and the comparison would even be more favorable to the United States if the dreadnoughts were included, for the United States has a tonnage of 172,100 in the dreadnought class.

After the completion of the three-year program, if some other nation does not put forth an extraordinary effort, all that will be required for the United States to maintain herself on the sea against any nation will be to keep pace with the construction program of the other great powers and develop an adequate personnel and merchant marine.

The naval problems of the United States will then relate to the development of a well-rounded fleet, a well-trained and adequate personnel and a merchant marine. The navy at last appears to be all that could be desired as far as the battleship fleet is concerned. Attention should now be directed to maintaining it on an efficient basis and the development of its auxiliaries. Its great auxiliary force will be the merchant marine.

In studying the accompanying table, due consideration should be given to the policy pursued by Great Britain in converting merchant ships into cruisers. The same policy will be followed by Japan and this must be met in the creation of the American merchant marine. Under the head of cruisers are included armored cruisers, cruisers of the United States Navy, cruisers, and light cruisers of the other navies. There is a great

	Great Britain				United States				France				Japan				Italy			
	Built		Building		Built		Building		Built		Building		Built		Building		Built		Building	
Class	No.	Tons	No.	Tons	No.	Tons	No.	Tons	No.	Tons	No.	Tons	No.	Tons	No.	Tons	No.	Tons	No.	Tons
Super-dreadnought...	23	576,250	None	None	11	319,300	12	454,200	3	69,531	None	None	4	123,600	4	128,000	None	None	None	None
Dreadnoughts.....	10	199,630	None	None	7	115,650	None	None	4	92,380	None	None	1	21,400	None	None	5	108,360	None	None
Pre-dreadnoughts....	14	214,900	None	None	14	208,500	None	None	10	165,999	None	None	6	99,800	None	None	4	49,700	None	None
Battle Cruisers.....	9	206,300	1	41,100	None	None	6	211,800	None	None	None	None	4	110,000	4	160,000	None	None	None	None
Coast Defence Vessels	30	301,790	None	None	16	124,889	None	None	3	31,612	None	None	7	78,166	None	None	6	59,738	None	None
Cruisers.....	94	545,740	9	66,230	19	162,190	13	93,000	13	143,531	None	None	18	134,500	9	45,000	10	38,000	None	None
Australia.....	5	27,568	None	None	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Flotilla Leaders.....	33	56,647	2	3,500	None	None	None	None	None	None	None	None	None	None	None	None	8	10,832	6	11,385
Destroyers.....	381	395,551	3	3,890	181	199,500	144	174,463	64	36,803	1	870	65	51,175	24	25,800	35	22,766	10	8,740
Torpedo-boats.....	31	8,700	None	None	4	16,080	None	None	67	6,610	None	None	9	1,248	None	None	96	15,155	4	640
Submarines.....	200	181,526	12	14,200	113	57,250	48	39,850	58	34,752	9	6,078	17	6,200	18	18,900	77	21,327	8	2,556
Mine Planters.....	6	32,100	None	None	4	16,080	None	None	2	1,134	None	None	1	2,000	None	None	4	13,178	None	None
Aircraft Carriers	10	107,870	1	26,200	None	None	None	None	None	None	None	None	1	7,600	None	None	1	8,800	None	None
Total.....	846	2,854,572	28	155,240	369	1,219,435	223	973,313	224	582,352	10	6,968	133	635,689	59	377,700	246	357,856	28	23,321

diversity in this type of vessels and there is really no adequate standard for comparison. The general board has recommended as a future policy the building of scout cruisers and the American Navy will not attempt to develop a fleet of light cruisers or smaller boats of this type.

The table is made up of the latest available official data and brought up to March 1. The ships authorized for the American Navy are not included, but only those which are classed as building by the Navy Department.—*Sea Power*, May, 1920.

PERSONNEL

PAY INCREASE FOR THE SERVICES.—By the adoption in conference of a final report providing increases in the pay of officers and enlisted men of the army, navy, marine corps and related services, the adjustment of pay which had its inception in the Stiness bill, introduced in the House in September, 1919, has now been accomplished. The bill was signed by the President on May 18.

In Washington the officers of the services affected by the increase, while accepting the action of the conferees as perhaps the best that a compromise based on political expediency could have produced, feel that the increases granted are still inadequate when measured by the admitted decrease to forty-eight cents in the buying ability of the American dollar. It can be said, moreover, that these officers are indignant that the bill should stop with the grade of colonel in the army and captain in the navy and cut off the four per cent of officers in the grades of general officer and of flag officer, whose economic problem is just as serious as that of a second lieutenant, and even greater. The officers declare that there is no possible excuse for this action of the conferees in making a dividing line in the service—a dividing line which no civilian employer would set up. This elimination of the general officers and flag officers is inexcusable, too, for what is gained? Figured on the provision of the Wadsworth pay bill, as to the army only $103,000 is saved the U. S. Treasury, that being the sum per year necessary to give the proposed Wadsworth increase to the general officers.

The computation of the increases in pay of navy officers under the bill, for shore and sea duty, are shown in the tables following:

SHORE PAY.

	Present pay per annum	Present pay and allowances	New pay and allowances	Increase, new bill: In dollars	Increase, new bill: In percentage
Ensign	$1,700	$2,151.30	$2,571.30	$420	19.5
Ensign 5 years' service	1,870	2,321.30	2,741.30	420	18.1
Lieut. (j. g.) 5 years' service	2,200	2,823.80	3,423.80	600	21.2
Lieut. (j. g.) 10 years' service	2,400	3,023.80	3,623.80	600	19.8
Lieut. (j. g.) 15 years' service	2,600	3,223.80	3,823.80	600	18.6
Lieut. 5 years' service	2,640	3,440.50	4,160.00	720	20.9
Lieut. 10 years' service	2,880	3,680.50	4,400.50	720	19.6
Lieut. 15 years' service	3,120	3,920.50	4,640.50	720	18.35
Lieut. 20 years' service	3,360	4,160.50	4,880.50	720	17.3
Lieut. Comdr. 10 years' service	3,600	4,575.15	5,415.15	840	18.38
Lieut. Comdr. 15 years' service	3,900	4,875.15	5,715.15	840	17.25
Lieut. Comdr. 20 years' service	4,000	4,975.15	5,815.15	840	16.90
Comdr. 15 years' service	4,500	5,651.70	6,251.70	600	10.6
Comdr. 20 years' service	4,500	5,651.70	6,251.70	600	10.6
Capt. 20 years' service	5,000	6,325.35	6,925.35	500	9.5

SEA PAY.

	Present pay	New pay	Increase: In dollars per annum	Increase: In percentage
Ensign	$1,870	$2,290	$420	22.4
Ensign 5 years' service	2,057	2,477	420	20.42
Lieut. (j. g.) 5 years' service	2,420	3,020	600	24.8
Lieut. (j. g.) 10 years' service	2,640	3,240	600	22.75
Lieut. (j. g.) 15 years' service	2,860	3,460	600	20.98
Lieut. 5 years' service	2,904	3,624	720	25.05
Lieut. 10 years' service	3,168	3,888	720	23.00
Lieut. 15 years' service	3,432	4,152	720	21.25
Lieut. 20 years' service	3,696	4,416	720	19.75
Lieut. Comdr. 10 years' service	3,960	4,900	840	21.21
Lieut. Comdr. 15 years' service	4,290	5,130	840	19.6
Lieut. Comdr. 20 years' service	4,400	5,240	840	19.1
Comdr. 15 years' service	4,950	5,550	600	12.1
Comdr. 20 years' service	4,950	5,550	600	12.1
Capt. 20 years' service	5,500	6,100	600	10.9

Pay of navy ratings as provided by the bill are as follows:

Chief petty officers, acting appointment, get $99 a month; permanent appointment, $126 a month; the ratings including chief masters-at-arms, boatswains' mates, gunners' mates, turret captains, quartermasters, machinists' mates, electricians, carpenters' mates, water tenders, yeomen, storekeepers, pharmacists' mates, bandmasters, commissary stewards and chief printers.

Petty officers, first class, get $84 a month; the ratings including masters-at-arms, boatswains' mates, gunners' mates, turret captains, quartermasters, all first class; boilermakers, coppersmiths, blacksmiths, plumbers and fitters, sailmakers' mates, water tenders, first musicians and commissary stewards; also machinists' mates, shipfitters, electricians, carpenters' mates, painters, storekeepers, pharmacists' mates, yeomen, ships' cooks, bakers and printers, enginemen, blacksmiths, coppersmiths, pattern makers, molders and water tenders, all first class.

Petty officers, second class, get $72 a month; the ratings including masters-at-arms, boatswains' mates, gunners' mates, quartermasters, machinists' mates, electricians, shipfitters, carpenters' mates, printers, painters, storekeepers, yeomen, ships' cooks and pharmacists' mates, all second class; oilers and printers.

Petty officers, third class, get $60 a month; the ratings including masters-at-arms, gunners' mates, quartermasters, electricians, carpenters' mates, painters, storekeepers, yeomen, pharmacists' mates, firemen, all third class; and coxswains.

Seamen, first class, receive $54 a month; the ratings including seamen gunners, seamen, shipwrights, musicians, first class; ships' cooks, third class; bakers, second class; hospital apprentices, first class; firemen, second class.

Seamen, second class, receive $48 a month; the ratings including seamen, second class; musicians, second class; buglers, ships' cooks, fourth class; hospital apprentices, second class; firemen, third class.

Seamen, third class, or apprentices, receive $33 a month.

Messmen Branch. Under this heading seven ratings are to be abolished: Stewards to commanders-in-chief, cooks to commanders-in-chief, stewards to commandants and cooks to commandants are to go because it has been decided that their duties may be confined to cabin stewards, hence no provision was made for these four ratings in the new pay bill. Mess at-

tendants, first, second and third class, ratings given men not citizens, are also dropped as the navy intends to have only citizens mess attendants and wardroom cooks, $72; for steerage stewards and schedules of pay will be as follows: For cabin stewards and cabin cooks, $84 a month; for wardroom stewards and wardroom cooks, $72; for steerage stewards and steerage cooks, $72; for warrant officers' stewards and warrant officers' cooks, $60; for mess attendant, first class, $42; second class, $36; third class, $33. The new rate is base pay, of course, but allowances as at present are to be revised somewhat to simplify division by days in the month.

By the terms of the third proviso of Section 13 of the bill it is perfectly apparent that the framers of the bill regard it only as a temporary measure. This proviso reads: "That a special committee, to be composed of five members of the Senate and five members of the House of Representatives . . . . shall make an investigation and report recommendations to their respective Houses not later than the first Monday in January, 1922, relative to the readjustment of the pay and allowances of the commissioned and enlisted personnel of the several services herein mentioned." After all the hearings that have been held on service pay increases, after all the baring by the officers of these services to the public of the most intimate details of the private economies they have had to practice in their family lives, after all the pressure that has been brought to bear by the press of the United States in their laudable effort to see common justice done to the officers of these services, it is not captious or unjust for us to regret that all this painful labor must be performed again before the services may have the hope of receiving advances of pay that will at least equalize the advanced cost of living. And no hope is held out to them of learning what the final "readjustment" of their pay and allowances will be until after the first Monday in January in 1922.

Among satisfactory provisions in the bill is that in Section 1 providing that pay increase shall begin January 1, 1920, and in Section 2 continuing in force "the rights and benefits prescribed under the act of April 16, 1918, granting commutation of quarters, heat and light during the present emergency to officers of the army [and also of the Navy, Marine Corps, Coast Guard and Public Health Service] on duty in the field" until June 30, 1922; and granting "such rights and benefits . . . . equally for enlisted men now entitled by regulations to quarters or to commutation therefor." Another is the furnishing transportation in kind to the wife or dependent child or children of commissioned, non-commissioned, warrant or petty officer on making permanent change of station, and giving to the personnel of the navy "the benefit of all existing laws applying to the Army and Marine Corps for the transportation of household effects."

In the difficult, halting advance on the weary road toward gaining a measure of justice, the services have been sustained by the splendid leadership and patriotism of Senator Wadsworth, chairman of the Senate Committee on Military Affairs, who has never wavered in the fight to gain for officers and men compensation commensurate with their service to the nation. Senator Page, chairman of the Senate Committee on Naval Affairs, also valiantly fought for a square deal all around; in fact, the majority of the members of the upper house have been ready and anxious to do the right thing in this time of stress. In the House, Representative Crago constantly and consistently championed the cause, ably supported by Representatives Olney and Stiness. To Chairman Kahn of the House Committee on Military Affairs the army is particularly indebted, because it was through his efforts that the army was given a hearing. The conferees from the House Committee on Naval Affairs, Chairman Butler and Representatives Kelley, Britten, Padgett and Riordan, are deserving of the thanks of the services for receding from the position of considering only the enlisted personnel of the navy. In all fairness to them it must be stated that they were under tremendous pressure to maintain this stand,

but finally they broke down the opposition of the House leaders and in conference showed themselves amenable to argument and agreeable to doing all that they believed they could do with the available amount of funds set as their limit. Representatives Kelley, Britten and Padgett particularly handled the matter with breadth and understanding.

On the part of the navy the commendation of commissioned and enlisted personnel for untiring effort to gain adequate compensation should go unstintedly to Rear Admiral Thomas J. Cowie and Comdr. L. W. Jennings, Jr. The army, too, is everlastingly indebted to Col. Edward L. Munson for his masterful handling of the army's interests, in which he was ably assisted by Col. Robert C. Richardson, Jr. Never retreating from the standard these officers set up at the beginning of the contest for recognition, they carried on in the face of the most discouraging obstacles and finally succeeded in carrying conviction into recesses where opponents to any increases in pay were strongly entrenched. They are deserving of all praise from their brother officers, particularly for bearing the brunt of battle cheerfully and as a duty of the highest importance.—*Army and Navy Journal*, May 1, 1920.

ANTWERP TRIP FOR NAVAL RESERVISTS APPROVED.—The plan to allow members of the U. S. Naval Reserve Force limited active duty aboard ships of the navy which will carry contestants and others to the Olympic games in Antwerp this summer, has been tentatively approved by Secretary Daniels. It is probable that the plan will be approved by Admiral R. E. Coontz, Chief of Operations, and shortly the Reservists will be informed of the plan and requested to make application for this limited duty.—*Army and Navy Journal*, May 1, 1920.

OFFICER AND ENLISTED PERSONNEL OF THE NAVY.—Rear Admiral Thomas Washington, U. S. N., chief of the Bureau of Navigation, in a recent communication to officers of ships and stations sets forth in very elaborate detail, largely in tabulated form, "an outline of the officer personnel situation and an estimate of the enlisted personnel situation" in the navy and urges a close study of both. We make the following extracts:

The allowance of regular and temporary officers until June 30, 1920, is 9879. There are 8044 officers, regular and temporary, allowed for 137,485 enlisted men. Regular officers in the service April 17, 1920, numbered 4195, and temporary officers 3278. The U. S. N. R. F. officers on duty on the above date were 1108.

The shortage of regular officers on April 17, 1920, was 3895, and the shortage on January 1, 1920, was 3722. The average monthly loss from January 1, 1920 to April 17 of the same year is 49.5.

Service since commission of regular officers has been as follows: Forty years and over, 43; 35-40 years, 46; 30-35 years, 94; 25-30 years, 135; 20-25 years, 267; 15-20 years, 669; 10-15 years, 779; 5-10 years, 920.

Admiral Washington gives the prospective gains by graduation of the Naval Academy class in June, 1920, as 290 officers. The losses from March 1 to April 17, 1920, are, deaths 17 and resignations 155.

The total strength of the enlisted personnel of the regular navy is approximately 105,400. The strength of enlisted personnel on April 1, 1920, is shown divided into tables covering the various classes of enlistment, classes of vessels of the fleet, and at shore stations. A recapitulation shows that the complement required for 773 ships is 125,913 men. Of this number the allowance is 95,267, and the number on board is 66,111.

The operating force of men ashore totaled 12,490; men on general detail ashore, under training, patients, prisoners, etc., numbered 22,870; total, 35,360.

Recapitulation of enlisted men with the fleet is as follows:

	Complement	Allowance	On board	No. of vessels
Atlantic Fleet	45,914	35,930	24,671	234
Pacific Fleet	44,108	35,582	22,390	220
Asiatic Fleet	2,835	2,242	2,631	23
Naval forces in European waters	2,060	1,697	2,211	9
Miscellaneous	27,496	16,316	10,904	287
Required for receiving ships and station craft	3,500	3,500	3,304	...
Total	125,913	95,267	66,111	773

Another table gives the distribution of enlisted personnel ashore on March 1, 1920, with the following totals: Operating force, 12,490; general detail, under training, patients, prisoners, etc., 22,870; total, 35,360.

"Every effort," says Admiral Washington, "has been made to reduce the number of men on shore to an absolute minimum. No further reduction in this number may be expected, as the total above shows what may be considered the minimum number of men who will not be available for service at sea. It may be expected that this number will be increased due to a contemplated increase in the number of men on recruiting duty, and due further to the bureau's intention to keep recruits at training stations for not less than three months and for the full four months, if possible. The recent heavy demands for even untrained men have necessitated withdrawing recruits from training stations after only one month to six weeks' training. The lengthening of the period of training will naturally increase the total number of men under training."

The total losses of men from all causes in January, 1920, were 5594, and in February the losses were 3667. Other extracts from Admiral Washington's circular letter follow:

"A considerable number of men in the losses shown are recruits. From December 4, 1918, when voluntary enlistments were resumed, until March 1, 1920, there were 71,486 first enlistments. Of these 58,045 were still in the service on March 1, 1920, a loss of 19 per cent of the men enlisted during this period.

"The enlistments or extensions of 30,814 men expire next year. This loss is not nearly as serious as the loss by expiration of enlistments and extensions this year, since these 30,814 men include 19,979 men who first enlisted for two years during 1919, and this large body of comparatively new men can scarcely in two years become as valuable as have the men of four or more years' service.

"During the last six months of 1919 there were 4666 desertions, including the desertions of 1057 petty officers and senior rated men (seamen and firemen, first class), of whom 60 were chief petty officers. During January of this year there were 898 desertions, including the desertions of 103 rated petty officers of whom 13 were chiefs. In February the number was smaller, due no doubt to the fact that the Atlantic fleet was in southern waters and desertion was difficult. The total for the month was 765, including the desertions of 60 rated petty officers and seven chiefs.

The total losses for January from all causes were 5594. These included honorable discharges, 2762; ordinary discharges, 295; undesirable, 544; bad conduct, 265; physical disability, 239; desertions, 298. Other causes of losses included inaptitude, 13; deaths, 27; retirements, 7, etc. The February losses totaled 3667, and included 1353 by honorable discharge; desertions, 765; undesirable, 309; bad conduct, 180; dishonorable, 180;

physical disability, 323; special order, 233; the other losses being due to retirements, deaths, transfers to reserve, furloughed, etc.

"Requests for discharge for dependency are now being received at the rate of 28 per day. An average of seven such requests are approved each day. With few exceptions the men making such requests are the older, experienced men. This produces a loss of about 200 trained men per month.

"From the foregoing it will be seen that not less than 4000 enlistments will expire before July 1, 1920. The losses due to special order, inaptitude, undesirable, bad conduct, dishonorable and medical survey discharges, indefinite furloughs, transfers to the reserve, desertions, deaths, and retirements may conservatively be placed at 6000 before July 1, 1920. The total loss by that date thus becomes about 10,000, of whom eight-tenths will be trained men.

"The present total strength is approximately 66,000 below the temporary strength authorized until July 1, 1920, and approximately 39,000 below the permanent strength. Fifty-five per cent of the present total strength is made up of men who first enlisted since December 4, 1918. While the information is not compiled up to date, figures on file show that 66 per cent of the first enlistments between December 4, 1918, and January 1, 1920, were of boys under 19 without previous military service. It may therefore be stated that two-thirds of the present first enlistment men are under 20 years of age. The remaining one-third do not average much above 20 years of age. This point cannot be too strongly emphasized as any plans for the distribution of personnel must take into account this great mass of as yet little more than raw and undeveloped material. Account must further be taken of the fact that the losses given are steadily reducing the number of men who can keep the wheels turning and can assist in developing the new men.

"Replacements. First enlistments are averaging 550 per week, with about 75 per cent of such enlistments for two years. Re-enlistments average 125 per week. Of the re-enlistments, the majority are chief petty officers. The chief petty officer class is already in excess and there are now 575 petty officers, first-class, on the eligible list for advancement to chief. The chiefs who re-enlist block the advancement of first-class petty officers, causing discontent and adding to the general state of unrest.

"The replacements total about 625 per week, which will add about 2500 men per month. Only an estimate can be made of the number of men who will re-enlist from now on. The following figures, taken at random, are given as indicative of what may be expected.

"One dreadnought of the Atlantic fleet will have left on board on July 1 exactly 18 per cent of the allowed electrical force and none of the electricians whose enlistments expire between now and that date intend to re-enlist. This condition, although not worked out to a percentage, is almost exactly the same for every rating of the artificer and engineer branches. A fleet repair ship with an already very seriously depleted complement, loses practically every artificer by July 1, with no re-enlistments in prospect. In the submarine flotilla, Atlantic fleet, the enlistments of 147 men, practically every trained or rated man, expire before the coming August. But seven of these men intend to re-enlist."

The output of the training stations between now and July 1 is expected to be 4500 seamen, second-class, and 1000 firemen, third-class. The output of the various trade schools between April 19 and July 1, 1920, is expected to total 2388.

Of the effect of increased pay Admiral Washington says:

"The effect on re-enlistments of the so-called Kelly bill increasing the pay of enlisted men is very problematic. A certain length of time must elapse before the provisions of the pay bill can be brought before ex-service men in civil life and more time must elapse before any of such men as do

re-enlist can settle their affairs, be re-enlisted, and actually become available for assignment to ships. Men who are discharged, even if they do re-enlist, cannot be counted on at once as nearly every one will take the leave to which he is entitled.

"A rough and unofficial survey made in October last substantiated the belief that had the Kelly bill passed then, between 70,000 and 80,000 ex-service men would return to the service. Each week that passes sees an increasing number of ex-service men who would have re-enlisted months ago definitely settled into civilian life, many of them married, with all idea of returning to the service entirely abandoned. The passage of this bill will unquestionably draw back to the service a great many trained men, but it is scarcely reasonable to expect that the modest increases provided will bring back many of the men we so badly need, mature, trained men, who, so long as existing conditions prevail in civil life, can do so very much better outside.

"Conditions on July 1, 1920. It is evident that by July 1 there will have been no material change in the figure representing the total strength of the navy. About 10,000 men will have been lost and about the same number added. Generally speaking, there simply will have been an exchange of men, about 8000 trained and valuable men plus 2000 others going out and about 10,000 raw recruits coming in. It is not believed that the pay bill will cause any appreciable change in the situation during this period.

Enlistments and re-enlistments between July and October will not bring in more than 7500 men, as summer is never a good season for recruiting. During this period we may therefore expect the same conditions as for the period from now to July 1, leaving us on October 1 with a somewhat smaller total strength, about 100,000 men, of whom 75,000 will be first enlistment men."—*Army and Navy Journal,* May 1, 1920.

SYSTEM OF VOLUNTARY TRAINING FOR THE NAVY.—An amendment that occasioned some surprise in the Senate was introduced by Senator Swanson providing for a system of voluntary training similar to that in the Senate Army Reorganization Bill and which had been prepared by the Naval Affairs Committee. The amendment, which carries an appropriation of $375,000 and was adopted by the Senate, authorizes the Secretary of the Navy to establish summer schools where youths of 16 to 20 years may receive training. After this they are enrolled in the Naval Reserve Force. Senator Swanson said it had been estimated by the Navy Department that 5000 young men could be trained yearly.—*Army and Navy Journal,* May 1, 1920.

MATÉRIEL

NAVAL APPROPRIATION BILL IN SENATE.—The Senate took up, and virtually completed, the Naval Appropriation Bill for the fiscal year ending June 30, 1921, on April 27. The only discussion of the bill during its reading came when the appropriations for aviation and the San Francisco Bay base were referred to, Senator King objecting to the aviation appropriation of $25,000,000 as excessive.

In reply Senator Lodge declared that it would be "wanton extravagance and not economy" to refuse the increase for aviation. "Hydroplanes and naval aircraft form, and will in future form, a most vital part of the service," said the Senator. "To have a navy without adequate aircraft would, under modern conditions, be like cutting off an arm." Senator Lodge also declared in favor of making the Pacific fleet a "capable, independent fleet and not merely half a navy. If trouble is coming our way," he said, "it is coming from that quarter. It is false economy to cut down money for the naval defence. It is most important for protection of the country. To cut is wanton extravagance. It is inviting disaster." Hawaii, Mr. Lodge added, is the American "outpost in the Pacific." "The Pacific

coast," he continued, "needs naval defence more than the Atlantic at this time, and it needs it now. We should strengthen the fleet and all appurtenances there. Also Pearl Harbor is very important."

It is provided that the board of navy officers to be appointed by the Secretary of the Navy to advise and report to Congress as to whether Alameda or Hunters Point, Calif., is the better site for a docking and repair plant for capital ships in San Francisco Bay shall make its report not later than October 1, 1920. The bill as it passed the House carried appropriations amounting to $422,939,574. The Senate Committee recommends additional appropriations amounting to $40,947,000, making the total of the bill amount to $463,886,574.

The additional appropriations recommended by the committee are itemized as follows:

Pay, miscellaneous	$1,782,000
Aviation	9,124,000
Fuel oil investigation	20,000
Gunnery and engineering exercises	50,000
Instruments and supplies	700,000
Training stations: California, $100,000; Great Lakes, $100,000; Hampton Roads, $200,000	400,000
Naval reserve force	450,000
Receiving barracks	200,000
Torpedo station, Newport, R. I.	200,000
Maintenance, Bureau of Yards and Docks	2,500,000
Public works	5,696,000
Maintenance, Bureau of Supplies and Accounts	2,000,000
Construction and repair of vessels	1,000,000
Engineering	1,050,000
Increase of navy construction and machinery	15,700,000

The report says, in part: "The amount appropriated by the House for aviation is $15,875,000. This committee has increased this appropriation to $25,000,000, which is the amount appropriated for the current year. The objects of expenditure are set out in a general way in the appropriation paragraph and comprise the construction of different types of aircraft, purchase of equipment, and maintenance and development of shore stations. This increase is urgently recommended by the responsible officers of the Navy Department, and is deemed necessary in order that steady progress may be made in the art of aviation.

"The principal items comprising the additional appropriations for public works are due to the contemplated development of the west coast for the proper maintenance and care of the Pacific fleet, which consists of half of the modern units of our navy. The committee deems it essential that adequate docking and repair facilities on the west coast be immediately developed and has recommended such additional appropriations in this bill as it believes will secure the desired action. Other appropriations are recommended for the navy yards and naval stations, both on the east and west coasts, which the committee deems necessary for the economical administration of those yards and stations, as well as to equip them for speedy and effective construction work.

"The Secretary of the Navy recommended to this committee the commencement of a rounding-out program of thirty-eight vessels, comprising light cruisers, flotilla leaders, etc., but the committee has deemed it wise not to undertake this program at the present time, but to postpone same until the next session of Congress.

"The bill carries the necessary appropriations to continue the construction of vessels heretofore authorized, viz., the 1916 three-year building program. This program was authorized by the Naval Appropriation Act of August 29, 1916, and consisted of 156 vessels. It is estimated that it will

be necessary to appropriate, in addition to the $108,000,000 carried in this bill, $361,735,000 to complete the 1916 program, and this latter sum will be distributed over three more fiscal years, as it will take four years to complete the battleships and battle-cruisers of that program.

"The committee recommends an additional appropriation of $11,700,000 under 'Increase of the Navy, Construction and Machinery,' to enable the Secretary of the Navy to purchase fabricated material at Hog Island for the completion and fitting out of seven type *B* vessels as aviation and destroyer tenders. The Secretary states that these tenders are necessary for the training and operation of the fleet and for the solution of the special strategic and tactical problems involved in the progress of naval aviation, and he further states that if these seven ships were built specifically as tenders under other conditions, at current prices, they would cost approximately $23,000,000.—*Army and Navy Journal,* May 1, 1920.

BATTLESHIP "OSTFRIESLAND" IN U. S. NAVY.—The ex-German battleship *Ostfriesland,* allotted to the United States Navy, was taken over by representatives of the navy at Rosyth, Scotland, April 9. The vessel will sail for the United States under her own steam, manned by a U. S. Navy crew.—*Army and Navy Journal,* Apr. 17, 1920.

WAR'S LESSONS IN NAVAL CONSTRUCTION.—Rear Admiral David W. Taylor, U. S. N., Chief of the Bureau of Construction and Repair, gave his views of the lessons of naval construction growing out of the World War in a paper read before the Franklin Institute of Philadelphia on April 21, which appears in the *Philadelphia Ledger.* Admiral Taylor said, in part:

"It is not yet possible to answer fully the question, 'What has been the effect of the World War on warship design?' For years it will be necessary to collate and study the enormous mass of experience from all possible sources, and the effect of this will be demonstrated in concrete form only after naval opinion has become crystalized as a result of discussion of the service at large. Our naval organization is such that service opinion necessarily controls policy; and although the naval designer may influence and interpret this opinion, the result in all cases will be that which this opinion dictates. This paper must, therefore, be considered more as a discussion of this intensely interesting subject than as a hard and fast laying down of principles.

"The first outstanding fact appears to be that the war has brought about no startling or revolutionary change, but has resulted mainly in the intensive development of existing types. A few new types have appeared, but with the single exception of 'aircraft carriers,' they have been of minor importance when measured by the cost and time required for production. It is not only to the few major naval actions to which we must look for influence on types of fighting craft, for we must also consider the general trend in the principal phases of continuing naval activity during the war period.

"One definite result from war experience which stands out is that all naval authorities are unanimous in the conclusion that nothing has occurred to affect in the slightest the ascendancy and pre-eminence of the capital ship, *i. e.,* the battleships and battle-cruisers, as the foundation of sea power. This conclusion is based not only on the overwhelming strategical results of the control of the seas exercised by the Allied battle fleets, but is supported by the successful test of modern vessels of this type under actual battle conditions."

After reviewing some of the results of the battle of Jutland as affecting design, Admiral Taylor discussed the value of aircraft, and concluded with a statement that although actual war has confirmed naval experts in their opinion that the large type of ship is most desirable, economic conditions may demand a smaller but equally efficient design.

"Although we must conclude that the experience of war, so far as it can be grasped to date, has resulted in a tendency toward increased size and cost," Admiral Taylor continues, "we cannot overlook the fact that this very tendency under the present financial, economic and political conditions in the world may actually result in the long run in the disappearance from future building programs of these very types and the substitution for them of smaller and cheaper units, made possible by new developments in science and engineering. To meet this condition there never was more need than at the present time of vision and imagination on the part of the fighting forces afloat and the naval designers ashore, for that nation which can develop the weapons which will render obsolete the present great ships and can substitute for them a smaller and cheaper unit capable of defeating them will win in the new era the command of the seas, which this war has shown is so all-important to ultimate victory."—*Army and Navy Journal*, May 1, 1920.

U. S. DESTROYER "COLE" MAKES RECORD.—The U. S. destroyer *Cole* has just made port in Constantinople, from Theodosia, in the Crimea, after the fastest long-distance run ever made by any vessel in the history of Black Sea navigation.

Starting from Theodosia, the *Cole*, with only twenty-four hours' provisions of food and water aboard, raced to Constantinople, nearly five hundred miles distant. She made the run in twelve hours flat, at an average speed of forty miles an hour.

The little town of Theodosia has become the busiest port on the Black Sea. The United States Near East Squadron has made Theodosia a regular port of call and the American Red Cross has established its relief headquarters for South Russia in the same small city.

Thousands of Russian refugees are crowding into the Crimea. Concentrating on the task of getting these fleeing Russians, many of whom have traveled on foot from points as far away as Petrograd, to places of safety, the U. S. Near East Squadron is sending every available cargo boat and war vessel to Theodosia to transport the distracted refugees to Constantinople. From Constantinople they are routed to various refugee points established by the Red Cross in Asia Minor and the Balkan peninsula.

Twelve Russian refugees were aboard the *Cole* in its record-breaking trip. They had lately escaped from Odessa and upon their arrival in Constantinople were turned over to the American Red Cross authorities, and placed in hospitals with many other refugees, being treated for wounds and typhus.

Crimea is the only outlet now left in South Russia for the exiles, and the situation there is fast growing desperate. The hordes of refugees who have reached Theodosia are utterly destitute. Hundreds are infected with spotted typhus. All are half starved and the food supplies of the Red Cross will shortly be inadequate unless thousands seeking relief can be taken to places nearer the base of supply.

It is hoped that the efforts of the United States naval authorities, assisted by the French and British, will succeed in averting this impending famine which threatens the lives of multitudes.—News Service of American Red cross.

MERCHANT MARINE

THE AMERICAN MERCHANT MARINE.—The extent to which our efforts in building up a merchant marine are being rewarded is indicated by the fact that more than 50 per cent of our exports in December of last year were carried in ships of American register. At the present time there are twenty-six freight services from the Port of New York alone. Other seaports are following closely, as Baltimore has twenty-five freight lines, New Orleans has twenty-four, Philadelphia sixteen, while Boston follows with thirteen, and San Francisco with nine.

Plans in formation for additional routes show that the Shipping Board has decided to compete with the British, Japanese and Scandinavian steamship lines for freights of all nations. One American line is planning on a fleet of steamers which will start from Baltimore and San Francisco to circumnavigate the world. At the present there are over two million deadweight tons in the American shipyards and while it is true that probably a number of larger and better ships will be used to improve service from American ports, the Shipping Board will undoubtedly employ a good many of the smaller vessels in the development of the special foreign services.

This program will depend to a great extent upon the ability of American ships to compete with vessels of other nations. Their success along this line yet remains to be proven. If they cannot operate as cheaply they will not be able to obtain the necessary cargoes and in such an event they will pass from the shipping world. We must all do our utmost to put the American flag in every port and to maintain such a service that American vessels can be seen in a constant traffic to all ports of the world.—*Shipping*, Apr. 10, 1920.

TRAINING OF SEA OFFICERS.—The effort being made by the United States Shipping Board to prepare men for active life as officers on our new merchant vessels is an experiment which is being carefully watched by a number of different interests.

The old-time method of learning everything by experience was one which required considerable time and many hard knocks, yet in some ways it had its advantages over any other method. However, in this day and under present conditions, where a large demand must be readily met, an effort of any kind which will tend to relieve the situation is one which is certainly worth trying.

There are many things which come into use in handling steamships or sailing vessels which can only be acquired by long practice, but on the steamship of to-day there is a great deal of machinery and other mechanical equipment which can be studied and learned as well ashore as by long years of toil and asking questions from other people who oftentimes are reluctant to give up information which they themselves have learned after a bitter struggle.

At the present time the Shipping Board is maintaining stations in Boston, New York, Philadelphia, Baltimore, Chicago, St. Louis, Atlanta and Los Angeles. People who do not live in or near these cities may make application to the Secretary of the local Chamber of Commerce who will advise them of the necessary procedure in order to get in touch with the proper authorities. These new men are sent to one of the free training schools which the government is maintaining at Camp Stuart, Va.; San Francisco, or Seattle, Washington. They are allowed $30 a month beside their living expenses while taking the training work. After a course of from one to two months the apprentice is placed aboard a vessel and is given actual work at sea on an allowance of $65 a month.—*Shipping*, Apr. 10, 1920.

BENSON VISUALIZES AMERICAN MERCHANT FLEET FINANCED BY AMERICAN CAPITAL AND OFFICERED BY AMERICANS.—American crews, domestic capital and the national mind turned toward the creation of a superior merchant marine were the themes emphasized by Admiral Benson in his official address before the celebrants of National Marine week at New York a few days ago. This is one of the first occasions at which the new chief of the United States Shipping Board has expressed his point of view as to America's position in present and future world commerce.

While he has not been in the post formerly occupied by John Barton Payne, the present Secretary of the Interior, sufficiently long to have evolved an intimate knowledge of conditions, he has a background of ex-

perience in naval operations and international relationships from which to draw the conclusions he has thus presented.

Admiral Benson has a bi-visual focus on the American merchant marine. He sees both a deep public-spirited feeling toward that feature of American business and the promotion of this maritime enterprise through private funds. He believes that individuals or concerns with enough money should take over the ships and operate them, but the public should be educated as to a realization of the importance of the shipping interests. Steps are now being taken to encourage and facilitate the investment of American capital in steamship companies, and Admiral Benson declares that prompt and vigorous action are needed to accomplish results. The co-operation of the public with private enterprise for conduct of an American merchant marine is an interesting aspect of the post-war shipping problems of this government.

Our merchant marine must be sustained if it is to be permanent. From the time the armistice was signed up to the present moment the United States Shipping Board has worked with the sole purpose of making permanent our re-created merchant marine. We are convinced that to make it so the ships now owned and controlled by the United States Shipping Board must be ultimately absorbed by private capital, owned and controlled by Americans and operated in open competition with the merchant fleets of the world. Knowing how important the merchant marine was in the World War, any American who lends himself to propaganda tending to injure American shipping is a mighty poor sort of American.

We have competition. We welcome all such competition. But it should be borne in mind that so far as the race for commercial advancement would make it so the war is over. Big opportunities developing for commercial advancement and enterprise are bringing this fact before us from time to time. America must wake up to a realization of this. Old commercial relations broken off by the World War, which lasted more than four years, are being renewed. The commercial advantages enjoyed by the enemy are no longer theirs. It is the trade which they developed to a high degree that now offers itself as nations cry for goods, more goods and the ships to carry them.

By the end of this year it is likely that most of the 2300 ships on the active building program will have been completed and in service. Already 1885 ships have been completed and delivered to the United States Shipping Board, according to the records up to March 30. These ships represent 10,509,457 deadweight tons. These deliveries comprise 948 steel ships which we contracted for; 365 steel vessels in addition which were requisitioned while in course of construction or under contract when the war began; 18 composite ships; 550 wood and 4 concrete. An inventory taken a few weeks ago shows that we had surplus material from the construction program in private shipyards, factories, and our warehouses in different districts of the United States totaling a cost value estimated at $300,000,000.

We erected 8642 permanent dwellings; 915 permanent housekeeping apartments; 102 stores; 95 dormitories; 5 hotels, and 6 boarding houses. We have sold of these more than 1653 houses at an approximate return of $50,000,000. The Emergency Fleet Corporation advanced $9,600,000 to improve, extend and equip street railways at 18 shipyards. We are collecting 5 per cent on $8,000,000 of this sum.

It is believed that there is a general failure to appreciate the importance—if not absolute necessity—of manning our ships with American citizens. Steps should be taken at the earliest moment to insure that at least all the officers on our vessels should be loyal citizens of this country. The rapid expansion of our merchant marine during the war forced us to accept the services of citizens of our allies. As fast as possible all foreigners now

serving as officers due to the shortage of officer personnel should be replaced by Americans.

The records of our Sea Placement Bureau during the last six months show an average of six out of every ten men who enter the service of vessels in our control are American citizens. It is encouraging to learn that this percentage is growing higher from week to week. The records of our New York office disclose that while in 1917 only 10 per cent of the men below the grade of officers placed on our ships were Americans, during the last six months the average has been 55.7 per cent.

Every hamlet has been reached in an effort to get the boys from interior towns to see life from a shipping point of view.

Progress has been made in the establishment of agencies in all ports of the world to look after our shipping affairs at foreign ports. But it is difficult to always pick the right men for these important places. The steamship owners, operators and those directly interested should give the United States Shipping Board the advantage of their suggestions and recommendations. Thus we may secure men who are especially well fitted for this service.

The board favors the passage by Congress of a marine insurance law that will strengthen and develop opportunity for home capital in the marine insurance field of this country. Marine insurance, as it has been pointed out by those who are experts in this field, is more than a fundamental agency of commerce. Its importance extends beyond ordinary service of protecting property. The strategic importance of marine insurance in upbuilding of foreign trade and a merchant marine must be considered at all times.

In view of the international situation that existed throughout the war every encouragement should be given to the control and use of the radio service by the government under the navy which has proven so effective and so useful to the commercial interests, not only during the war, but since the armistice. During and particularly since the blockade was raised has this need developed. In fact in order to in any way meet the commercial needs of commerce not only to the continent of Europe, but with the Far East and our west coast, it becomes absolutely necessary to use the navy radio stations more and more. Even these are not sufficient in number or capacity to meet the needs above what the cables can meet. Therefore we urge greater support of a centrally controlled wireless telegraph service under direction of the navy to promote safety of life and property at sea, and to give to America the advantage of constant commercial information.—*United States Bulletin*, Apr. 19, 1920.

ENGINEERING

THE HORSEPOWER OF GASOLINE ENGINES.—A close approximation to the brake horse power of a gasoline engine of average efficiency in good order, between the limits of 500 and 1500 or more revolutions per minute, is given by the formula $n\,l\,d^2\,r/12{,}000$, where n is the number of cylinders, l length of stroke in inches, d diameter of cylinders in inches, r number of revolutions per minute. When the measurements are in millimeters the following gives practically the same result, viz., $n\,l\,d^2\,r/200{,}000{,}000$. Taking the revolutions at 1000, the formula simplifies down to $n\,l\,d^2/12$ or $n\,l\,d^2/200{,}000$. The former expression is used for purposes of taxation in South Africa and Australia. It may be added that the applicability of this formula is not confined within any special range of dimensions, nor to any particular types of engine.—*Engineering and Industrial Management*, Mar. 25, 1920.

IGNITION MAGNETO INSTALLATION.—Gear drive is the best method of driving a magneto armature and direct spur-gear connection is better than either bevel or spiral gear trains because it is the best wearing form of gearing. Silent chains may be used for driving if some form of adjustment

is provided to compensate for chain stretch. When a magneto is driven by a shaft, it is customary to provide some sort of a universal joint or Oldham coupling between the armature and the driving member in order that any inaccuracies in alinement of the driving shaft will not stress the ball bearings supporting the armature. It is desirable to protect the instrument from oil or water by placing it in a case of rubber or leather and in modern types the contact breaker and distributor housings are closed by easily removed dust-tight coverings.—*Scientific American,* Apr. 17, 1920.

GERMAN SUBMARINES.—Very many people were led during the war to believe that in the design and construction of submarines the Germans had shown themselves superior to our own British naval experts, and certainly the results which their underwater craft achieved may have justified that belief, although it must not be forgotten that our own submarines were responsible for some particularly daring feats. Mr. Johns' paper on German submarines completely contradicts the prevailing belief, and shows that neither in design nor construction were the enemy's submarines better than our own. Nor is his a personal opinion, for British officers who have been present on trials of German submarines since the armistice state that they prefer their own boats, although they admit that there are certain details in which they consider the enemy craft are better than our own. We possessed the longer, the speedier and the more heavily armed vessels, the K-boats being 30 feet longer than the largest German submarines, and the surface speed 24 knots as against 16, with submerged speed 8.5 against 7.4. From the nature of the case the enemy's vessels had a larger sphere of action and greater endurance, but this rather mitigated against their value as fighting craft. But our greatest triumph was the installation of steam turbines on submersibles which resulted in so great a surface speed being obtained, thus adding considerably to the possibility of surprise attacks being delivered against the enemy's fleet. But most surprising of all is the fact revealed, we believe, for the first time, that the time of construction of the German submarine was not less than for our own, but that in certain cases we succeeded in building at a considerably shorter time than did the Germans.—*Shipbuilding and Shipping Record,* Apr. 1, 1920.

DEMAGNETIZING A WATCH.—In working around an old-type bipolar generator having an extremely large magnetic leakage, a writer in an American contemporary states that his stop-watch became magnetized so that when he snapped the watch to start, the resetting lever dragged the cam to its point before releasing, thus moving the hand from 0 to 30 seconds in a small fraction of a second, before the wheel engaged with the watch mechanism. To de-magnetize it, he took a coil about 5 inches in diameter, consisting of 600 turns of No. 30 B. and S. gauge magnet wire, and connected it to 110-volt 60-cycle circuit. Then tying the watch to a piece of string and twisting it so that it would spin around, he passed it through the coil with the watch spinning rapidly. He adds that there was not a trace of permanent magnetism left in the watch after performing this operation once.—*Engineering and Industrial Management,* Apr. 8, 1920.

REDUCTION GEARS IN WARSHIPS.—When one considers the number of war vessels to which mechanical reduction gearing was fitted between the turbine and the propeller shaft, and when one considers the short time which has elapsed since its first experimental trial in 1910, it is truly remarkable how few have been the failures which have occurred. Engineer Commander Tostevin in his paper gave an account of the failures which had actually occurred on 556 sets of all-geared turbine installations in the navy, some of them extending up to nearly six years. No actual breakdown of the gearing occurred, although on three vessels the gearing

had to be removed for refit owing to misalignment, necessitating dressing up and in one case a new pinion. There were two cases of fractured teeth, but in neither case was the gear removed, but the broken or cracked portions were taken out and the damaged teeth smoothed up, the gear then being run minus a portion of one or two teeth. Six other cases of failure occurred during trial trips, and before the vessels were handed over to the Admiralty. This is an absolute confirmation of the results which have been obtained in the merchant service and should remove any doubts which may still be harbored as to the possible unreliability of mechanical reduction gearing when transmitting large powers. Of course, it is even yet too early to speak of the life of the gear, although gears which have been running for five or six years still show but little sign of wear, and are apparently good for many more years of active service, provided always that the lubrication of the teeth is properly maintained.—*Shipbuilding and Shipping Record,* Apr. 1, 1920.

NAVAL OBSERVATORY TIME SIGNALS.—To illustrate the accuracy of the time signals sent out by the United States Naval Observatory, especially as distributed by wireless, Mr. C. C. Wylie, of the observatory staff, has recently cited the record of a specimen month (February, 1919). Each signal is recorded on the chronograph with the standard clock so that the error may be accurately determined. The errors in setting the transmitting clock were almost negligible; viz., 2 of 0.02 sec., 21 of 0.01 sec., and 5 of 0.00 sec. Due to erroneously forecasting the rate of the standard clock there were, however, larger errors, the maximum being 0.08 sec. To the signals from the three wireless stations operated by the transmitting clock of the observatory the corrections for lag have been determined as follows: Arlington, +0.02 sec.; Great Lakes, +0.10 sec.; Key West, +0.28 sec. Whenever great accuracy is required, it is advisable to use the messages distributed by wireless rather than those sent over the ordinary telegraph lines.—*Scientific American,* Apr. 17, 1920.

THE DEVELOPMENT OF NAVAL MACHINERY.—The introduction into the navy of the water-tube boiler may perhaps be taken to mark the inauguration of a new era. For many years the importance of speed had been underestimated by those responsible for our naval policy, and as a consequence there was little difference between the machinery built for warships and for mercantile vessels. When the advantages of high speed began to be realized, the attempt to gain this by means of forced draft applied to the ordinary type of marine or locomotive boilers resulted in serious troubles. These were only partially alleviated by fixing ferrules at the mouths of the fire tubes. If our memory serves us, the first real step in advance was made by Sir John Thornycroft with the boilers of the *Daring,* and his example was quickly followed by other eminent builders. When, however, the proposal was made to adopt water-tube boilers for the main units of our navy, a very storm of protest arose, and the country owes much to the naval engineers of that date, who persisted in carrying through this most unpopular policy where weaker men would have yielded to the clamor and postponed this most necessary reform until its value had been demonstrated by foreign navies. Of course, we have amongst us unscientifically-minded men like the late Lord Beresford, who vociferously maintained that our navy should never lead in the introduction of mechanical improvements, but merely copy these as they were originated by foreign thinkers. Had such views prevailed, our supremacy would have been jeopardized.

It remains, of course, true that the water-tube boiler is still a rarity in the mercantile marine, but, as Sir George Goodwin has pointed out, there are most essential differences between the requirements of the two services.

A merchant ship covers most of her mileage at a speed not greatly different from that obtained on her full power trial, whilst in the navy the power at cruising speed is commonly one-tenth or less of that developed on the steam trials. Moreover, the equipment must be such that it is possible to attain full speed and power with the greatest possible rapidity. A modern destroyer, with steam up, can in fact, attain full speed from rest in less than 10 minutes, a feat made possible by the use of oil fuel, a departure in which again our navy led the way.

The most striking and important innovation which has characterized the history of naval machinery during the past few years has, however, been the introduction of the marine turbine. The new departure was, as Sir George Goodwin observed, not adopted without some feeling of regret at the supersession of the splendid reciprocating engines which, as the results of generations of effort and experience had attained about their acme on the one hand in the engines of high-speed destroyers, and on the other in the engines of the *Good Hope* class, which developed 15,000 h. p. on a single shaft. Such engines at work were a truly impressive sight. The geological record shows, however, that an organism seems never to be in more danger of supersession than when it has apparently attained the height of its development, and a similar phenomenon is often observed in mechanical matters, and so it proved in the present instance. Marvellous as the high-speed destroyer engines were, yet, as the late Mr. Carnt pointed out, a trial trip was always a matter of anxiety in spite of the very great care exercised in the shops to ensure that nothing but absolutely sound material entered into their construction. There were indeed repeated instances of wrecked engine rooms due to the fracture of defective connecting rods which had passed successfully the closest scrutiny in the course of their manufacture. There was an end of such disasters with the introduction of the turbine into the navy. This gave us a long lead, which was followed but slowly and under protest by warship constructors elsewhere, who were loath to believe that their slowly and expensively-acquired experience had suddenly become almost valueless.

With marine turbines the worst to be feared is a strip which has no such disastrous consequences as the fracture of a connecting rod, and it is interesting to note that Sir George Goodwin is able to give what is, on the whole, a satisfactory statement as to the comparative absence of blading troubles in the navy. In the case of reaction blading the ordinary brass alloy has, he states, lasted well, but with the introduction of impulse elements, blading troubles increased. This is quite in accord with land experience where, when disc and drum machines were first introduced, the impulse blading failed far more frequently than did that in the reaction sections. The higher stresses, to which impulse blading is commonly subject, necessitates special care in its design and manufacture, and inexperienced makers have suffered accordingly.

Sir George Goodwin, in his presidential address, states that in the navy phosphor bronze is being adopted for such blading, as the strength is only reduced from an original value of 23 tons per square inch at ordinary temperatures to 20.7 tons at 450° F. A still stronger material is, however, desired. The steel blades, nickel coated, introduced by Mr Ferranti, are, it is said, giving good results, so far, on the two destroyers to which they have been supplied. The process is, however, only suitable for blading of uniform section, which is a drawback when the blade is to be heavily loaded.

One notable point in Sir George's address is the statement that there has been no blade erosion in the navy. This is common on land, and has sometimes been attributed to the presence of water in the steam. This hypothesis seems, however, definitely disproved by the experience cited, which seems to indicate that the erosion should be attributed to lime

carried over from the boiler in priming water. As distilled water is used for the make-up in the navy, there is no lime present, and the blades escape erosion accordingly.

Credit is also due to the navy for its enterprise in adopting reduction gearing between the turbine and the propeller shaft. For this innovation, again, the credit is due to Sir Charles Parsons, whose first installation was fitted to a launch in 1897. The turbine was of 10 h. p., and the propeller ran at 1400 r. p. m. A period of 12 years intervened before the next installation was fitted to the *Vespasian*. Since then progress has been rapid, and to-day as much as 18,500 h. p. is being transmitted through a single pinion, the pitch line speed being 132 feet per second, and the load carried nearly 700 pounds per linear inch of pinion face.—*Engineering*, Mar. 12, 1920.

SOAP FOR PETROL TANK REPAIRS.—All motorists should carry with them a little soap for use in gasoline tank repairs. It is not generally known that soap does not dissolve in gasoline and thus makes an excellent medium for the filling in of holes. A good amount plastered over an opening will keep the situation tight for a long while. Soap may also be rubbed on the thread of the union nut.—*Scientific American*, Apr. 17, 1920.

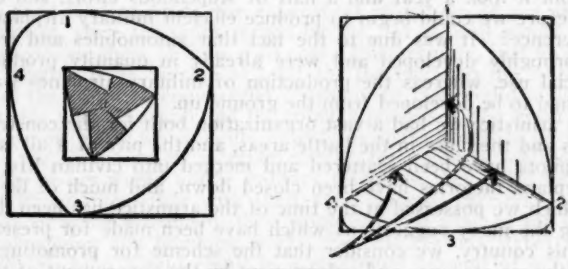


FIG. 1.—The "Radbore" Head.

MAKING THE SQUARE HOLE COMMERCIAL.—During the past few years a device has been developed, as useful as it is ingenious, which will drill a square hole through solid metal in a single operation. The device, which can be readily attached to any milling machine or drill press is a square hole drilling attachment based on the principal of the Cardan circles.

This tool, known as the "Radbore" head, is of surprising simplicity as the accompanying cut will show. Figure 1 shows the principle of operation. Cutting edges which sweep across surface into which the drill is fed, are ground on end of drill of which figure 1-2-4 is a shank cross section. The drill operates inside of the square guide shown.

The drills have a positive drive from the spindle of the machine and the cutting lips follow a path determined by the adjustable jaws of the head, so that no preliminary round hole is necessary. The cutters are so designed that there is no material in the bottom of the hole which is not removed by the cutting edges; therefore blind square holes can be obtained in one operation and without any subsequent finishing.

There are two designs in which this drill is made, one for the quick and accurate completion of sundry jobs, the other for heavier work and

hence of greatest commercial value in the factory on production. The lighter type derives a hole with filleted or rounded corners, while the heavier type produces square holes with sharp corners. This latter type is of significant use in die work, the squaring of key-ways, etc.

The entire proposition of drilling square holes with the "Radbore" attachment has narrowed itself down to the rapidity of round hole drilling. Being a free cutting tool with sufficient chip clearance, a heavy pressure on the feed is unnecessary, and aluminum can be drilled as easily as the toughest steel, a perfect chip being thrown in either case. Additional advantages are those of obtaining a blind hole with a perfectly flat bottom; no chance of the drill being led off by sand or blow holes; no previous preparation required. Also since the drills are sharpened on the end, there is no loss in size resulting.

Numerous methods of machining and drilling square holes have been brought to public attention, from time to time, and have been frowned upon by practical engineers and manufacturers with just cause.—*The Tech. Engineering News,* Mar. 12, 1920.

AERONAUTICS

THE AERIAL MAIL AND AVIATION.—When we entered the war the government had no difficulty in obtaining prompt delivery of passenger cars and trucks; but it took a year and a half of stupendous effort, and enormous outlay, before we could begin to produce efficient military airplanes. Why this difference? It was due to the fact that automobiles and trucks had been thoroughly developed and were already in quantity production for commercial use, whereas the production of military airplanes was a new art and had to be developed from the ground up.

At the armistice we had a vast organization both for the construction of machines and their use in the battle areas, and the pity of it all is that our trained pilots have been scattered and merged into civilian life, that our great airplane factories have been closed down, and much of the valuable assets which we possessed at the time of the armistice has been dissipated.

Among the many suggestions which have been made for preserving the art in this country, we consider that the scheme for promoting aviation through the maintenance and enlargement by the government of the Aerial Mail Service, as so ably advocated by Colonel Vincent in his recent address before the Society of Automotive Engineers, is the most practical. This authority believes that if the government were to promote and extend the Aerial Mail Service and enlist the coöperation of manufacturers of planes and engines, it would be possible ultimately to place it upon a paying basis. An enlarged and extended service of this kind would result in sufficient orders to encourage the manufacturers to maintain a considerable proportion of their plant which was developed for war purposes, and so preserve a part of the large working forces which at the time of the armistice had acquired the necessary skill for turning out the best and highest types of planes and engines. Says the Colonel: "I have given this matter considerable thought, and the more I think about it, the more I realize the possibilities of bringing about a wonderful development in aeronautics through the use of the Aerial Mail as a vast proving organization, and I feel sure that if such a program could be made a reality, there would be absolutely no question that the United States would lead the world in aeronautics inside a very few years." There is a general consensus of opinion throughout the world that the adequate commercial development of the airplane can be secured only if the various governments stand back of the movement. At the same time, the best way to bring about such a development is to have a real use for the article which is to be developed, and such a use is to be found in the Aerial Mail Service.

The Aerial Mail Service was very well handled, considering the limited appropriations available, but to make the thing a success, it should be

developed on a very much larger scale and with more liberal appropriations. If this be done it will bring about the following results:

Because the airplanes must fly on schedule time and must have greater cruising radius, it is believed that airplanes of greatly increased reliability and radius would be evolved. Moreover, the cost of the planes would be gradually reduced. The airplane itself can be designed and got into production in less than one-third of the time it takes to develop the engine; and since the quantity of orders would be large, manufacturers would tool up their shops and very shortly economical and reliable airplane engines would be developed.

The development of the Aerial Mail would put the country in a strong position for any military emergency. Instead of losing the technical knowledge and expert artisans which were developed during the war, a large program such as this would increase technical knowledge and develop craftsmen so that, should war come, material for a wartime aircraft organization would be immediately available. Moreover, there would be a constant demand for reliable pilots and we would always have a large number of such in training and available for an emergency.

In keeping the aircraft industry alive, such a governmental program would promote the development of commercial aeronautics, and this in its turn would lead to developments which would react favorably in assisting the Aerial Mail Service. Moreover, the country would obtain a complete system of good landing fields, the expense of which would not fall upon the government, since the cities served by the Aerial Mail would be only too glad to provide them at their own cost. Furthermore, just as a strong Merchant Marine is an invaluable asset for the navy, so the Aerial Mail Service and the resulting commercial development that would undoubtedly go side by side with it, would find the country possessed of a great number of airplanes and pilots which could quickly be made ready to do valuable service for the army, and, to a certain extent, for the navy. Although the Mail Service planes would not be military machines, they could be so constructed, without interfering with their value as mail carriers, that, with the addition of some armament, they would be well adapted for observation, photographing and bombing work. For the reasons stated above, a program of this kind would result in a maximum amount of activity and development at a minimum cost to the government. The government has a job to do, and, by using airplanes to do it, the revenue accrued from such operations could be applied toward the cost of equipment and maintenance. The experience already gained indicates that once it is firmly established the Aerial Mail Service can be made almost, if not entirely, self-supporting.—*Scientific American*, Apr. 24, 1920.

NEW AIRSHIP HANGARS READY SOON.—When the United States Navy contracted last summer for a dirigible larger than the *R-34*, plans were immediately started for a hangar to house it.

The new navy hangar at Lakehurst will accommodate two dirigibles both more than twice as large as the *R-34*. It will be larger than any hangar in the world, either in construction or plan.

Plans and specifications were prepared and contracts awarded last fall. The building as originally projected was to be 800 feet long. Changes since then have been suggested to increase the length of nearly 1000 feet. It will have a width of 318 feet and a height of 200 feet.

The double doors at one end, consisting of two leaves, are 177 feet high and 136 feet wide. They have a frame of structural steel, braced to a width of 76 feet at the bottom. Special railway tracking is provided as a slide for these tremendous portals.

When opened, the doors and the arch of the roof form a windbreak nearly 600 feet wide, insuring safety in landing and releasing the ships.

Overhead trolleys are provided for the construction of airships. Three docking rails of special design for landing, releasing and mooring purposes extend the length of the building for 1500 feet in front.

It is expected that the hangar will be completed during the coming summer.—*Aerial Age Weekly*, Apr. 19, 1920.

DO THE GERMANS LEAD IN AVIATION?—In the world of science there is no nationality, no barriers, no racial hatred. Thus it is possible to analyze the respective achievements of various nations in their true light and arrive at an unbiased opinion.

With that fact as a starting point, we can consider aviation as a whole since the ending of the war. In casting about we find practically all the nations, with the exception of Germany, still building airplanes of canvas and wood, much the same as they did in the early days of the art. True, their present constructions are much stronger and better, and the factor of safety has been materially raised; but the fact remains that, considered basically, the airplane is the same as it was in the beginning.

Now in the case of the German aircraft constructors, they seem to be forging ahead with all-metal machines. At first their all-metal constructions took the form of relatively small monoplanes and biplanes, but latterly they have gone to larger machines. According to the meager data, we learn that it has a wing spread of 120 feet and makes a speed of 100 miles per hour. It has a cruising radius of 20 miles. It has four powerful engines, presumably of 300 horsepower each, making a total of 1200 horsepower at least. This machine is of the flying boat type, with an unusually large hull. The crew is accommodated in the roomy boat body, as well as in the cabin over the wings. Most remarkable of all, perhaps, is the fact that the entire construction is of a special aluminum alloy. Even the wing surfaces are formed of sheet aluminum alloy.

In view of this machine and so many others which have come to our attention, we are forced to admit—and reluctantly, to be sure—that the German aircraft constructors appear to lead in this newly developed art. And the United States, despite the great strides it made during the war, bids fair to fall back again to its old position on the list of aerial powers—a position among the smaller nations whose finances do not permit them to indulge in an air fleet of the first rank. Already these are ample signs that the French, British, Italian and other European nations, even though they may be behind Germany, are forging ahead of the United States at an alarming pace.—*Scientific American*, Apr. 24, 1920.

EXPERIENCE WITH FOKKER SHOW NON-INFLAMMABLE FABRIC USED.—During a series of experiments with the Fokker, the Engineering Department of the First Pursuit Group at Kelly Field, Texas, found to its surprise that the plane was covered with non-inflammable fabric. The material used in this test was a piece of covering from the standard *D-VII Fokker* wing which, when exposed to the flame of a blow-torch, showed that fireproofing had been accomplished to such an extent that even though the torch was held at one spot a considerable time must elapse before a hole appeared and there was no spreading of the flames to larger areas than that covered by the blow torch.

The early German planes on the front went down in flames often enough to justify the opinion that only the very late ones possessed this covering.—*Aerial Age Weekly*, Apr. 19, 1920.

NEW AIRCRAFT GUN TO BE GIVEN TESTS.—A new type of aircraft gun has been developed and soon will be given its final tests at Bolling Field, Washington, D. C. It is the outcome of a series of experiments made at the Poole Engineering and Machine Company, Woodbury, Md., and its development is said to have been due largely to Arthur S. Baldwin, manager of ordnance and chief engineer of the concern.

The new weapon, which is to be mounted on the bow of the aeroplane, fires one-pound shells at the rate of 120 per minute. The shells are fed into the chamber of the gun from a magazine controlled by the operator. The weight of the gun proper is only 129 pounds.

A novel feature of the new weapon is the method of sighting. A machine-gun of the type commonly used in aeroplanes is mounted alongside the barrel of the larger gun. The operator uses two triggers, one of which controls the machine-gun, and it is with this he opens fire. Every fifth shot is what is known as a "tracer," a bullet containing substances which leave a trail behind of fire and smoke. When the operator sees from the tracer bullets that he has the correct aim, he opens fire with the one-pound gun. The machine-gun can be removed and a sight of the usual variety used when necessary.—*Aerial Age Weekly*, Apr. 26, 1920.

SUPPLY PARACHUTES TO AIR SERVICE UNITS.—After a series of tests a satisfactory aeroplane parachute has been developed and adopted for use by the Army Air Service. Supplies of parachutes are now being distributed to various organizations in the field.

The aeroplane parachutes are installed, tested and used under the supervision of graduates in this work in order to insure against the possibility of accidents.

Opportunities will be given to all officers and enlisted men who may desire to make actual use of them in connection with their flying activities.—*Aerial Age Weekly*, May 3, 1920.

OXYGEN HEATER FOR HIGH ALTITUDE FLIGHTS.—The engineering division, air service at Dayton, Ohio, is conducting tests on a new apparatus for heating oxygen at high altitudes to prevent a recurrence of failure at high altitudes, such as experienced by Major Rudolph Schroeder recently in his record climb at Dayton, which came so near to costing him his life. The apparatus consists of a confined thermostatic interrupter in connection with electric resistance coils, attached to a Pronty oxygen generator. The apparatus heats the oxygen as it leaves the exhaust valve of the container, and keeps it heated until it reaches the distributor. This prevents any moisture present from freezing in the delicate distributor, and it also heats the oxygen again before it enters the pilot's mask. Tests so far have proved the new invention to be of material value. Notwithstanding the fact that this apparatus functioned exceptionally well, further and more strenuous tests will be conducted and further improvements will be made.—*Army and Navy Journal*, Apr. 17, 1920.

EQUIP PLANES WITH EIGHT GUNS.—Four De Haviland aeroplanes have been equipped with machine-guns and will soon be sent to the Mexican border for tests.

Each of these planes now carries two fixed synchronized guns, two fixed Marlin guns projecting through the floor of the pilot's cockpit, two flexible guns on the upper gun mount and two Lewis guns at the rear of the observer's cockpit.

The machine-guns are so arranged that the pilot can fire his synchronized guns squarely at his target. As he gets closer he can raise the nose of the plane slightly, firing at the target with the lower forward guns. The pilot and observer thus have four sets of guns available as the plane comes within range and passes over the target.—*Aerial Age Weekly*, Apr. 26, 1920.

REVOLUTIONARY IMPROVEMENTS IN AEROPLANE CONSTRUCTION ANNOUNCED BY HANDLEY PAGE.—Revolutionary improvements in the construction of aeroplanes, which will make it possible to get the same performance that we get from present-day aeroplanes for one-third of the power,

were announced by Mr. Handley Page on March 23 at the joint meeting of the Aero Club of America and New York Electrical Society. The details of these revolutionary improvements were not disclosed on account of pending patents.

The great economic value of this improvement is made evident by Handley Page's statement to the effect that it will be possible to build an aeroplane equipped with only 25-horsepower, 18-foot wing span, which will be capable of carrying two people 500 miles. Again, that the present twin-motored Handley Page biplane when constructed by the new method will give the same performance with only 300 horsepower, or one-third of the present horsepower. This large decrease in horsepower required to operate aeroplanes and the corresponding saving in weight and cost of fuel not only increase the ratio of useful load, but also greatly decrease the cost of operation. In other words, this new development will make it possible for aeroplanes to compete economically with the other means of transportation in carrying passengers, mail, express and freight!

Handley Page, in his interesting address, reviewed the evolution of transportation from the earliest stages, and said in part:

"Let us briefly review then the stage to which mechanical transport had reached before the present flying era. Speed on the ground was about 100 miles per hour, although some special experimental trains were built and operated near Berlin about 15 years ago which attained a speed of 120 miles per hour. On the ocean the fastest torpedo boats had reached speeds of between 40 and 50 miles per hour, and both these means of transport had reached the economical limits of weight per horsepower development, and for further progress man had to turn to the new element, namely the air, the invention of which had been made possible by the development of the gasoline motor.

"Aviation in the early days was a case of managing to keep off the earth at all cost, but without any thought of efficiency. The weight per horsepower was in the neighborhood of 40 and 50 pounds, the modern starting point of successful flights for the Wright Brothers in this country in 1903. Then followed the improvement of machines from an efficiency point of view, the stream lining of the body, the improvement of plane areas, the reduction in weight per horsepower of the motor, together with improved methods of carburetion. All these lessened the weight per horsepower of air vehicle and permitted of the attainment of higher speeds. So from the old machines doing about 40 to 50 miles per hour, with a weight per horsepower of 40 to 50 pounds, we have progressed to the modern scout, which only weighs seven or eight pounds per horsepower all told, and has a top speed of 150 or 160 miles per hour in still air.

"The millions which have been spent in every country in air development have made this great progress possible and aircraft movement is exceedingly fortunate in that amidst the great suffering caused by the war the aircraft industry has reached a point of development which it could not have obtained by years of normal peaceful achievement.

"Of this development full advantage should be taken so that the investment so made is not lost. In this direction, with the coming of peace, our own company have devoted their energies in the research department to the perfecting of an airplane with less weight per horsepower, but still a high speed of travel.

"The type of machine which we now have flying is a useful weight of 3500 to 3600 pounds, apart from petrol and oil or crude, a speed of 115 miles per hour and a non-stop flying capacity of 500 to 600 miles. With the later improvements that we now see possible, we expect to reduce the horsepower required for this performance to 300, with a corresponding decrease in cost of operation. The same advantage, too, can be gained

in small machines, and we can visualize a small machine of 25 horsepower capable of carrying pilot and passenger at a speed of 100 to 110 miles per hour for a non-stop distance of 400 or 500 miles. If we now look back along the whole long-drawn-out history of the world's economic development, can we not at this moment feel that we stand at a new point of development in the world's history and that the airplane points the finger post along the line of commercial development and shows us the instrument to hand for future development. The instrument is in our hand—the airplane—but it is of no use without those secondary adjuncts to a service that makes schedule timekeeping a certainty. The provision of flying fields and emergency landing grounds along an air route, the setting up of weather bureaus with a good staff of men able to forecast the weather, the provision of wireless communications so that information is readily obtained, all is essential if the air route is to be organized and satisfactorily maintained.

"In Europe this work was a necessity for satifactory military operation. Great attention was devoted to it at the front and along the air routes leading to it. Of this development, we, in England, have been able to take advantage and with the ground work available and large machines converted from war purposes to those of peace, it was easy to start services. The results have been very satisfactory.

"Although we have been operating only during the winter months, for flying outside England was not permitted before September 1, 1919, we have flown no less than 82,428 miles, have carried 4201 passengers and 49,467 pounds of freight without injury to a single passenger or loss of a pound of freight, a record which can surely challenge any other means of transportation. I understand that in this city alone over 1500 people lost their lives in automobile accidents on the streets. These records show what can be done even with a new improvised service organized quickly on the coming of peace.

"The influence of air transport is going to be enormous in the world's development. To a great country such as the United States of America, where towns are separated by great distances, the airplane will act like a gigantic hand and squeeze these towns and cities close together. Distances are measured by mankind by the time which it takes to go from one place to another. The distance of 1000 miles or so from New York to Chicago means nothing to the business man. He knows only of the 20 hours on the train. By air, in seven or eight hours, or less, with a following wind, Chicago moves closer to New York and is no further away from the point of view of time in the air than Syracuse is on the railroad to-day. *Flying*, April, 1920.

MISCELLANEOUS

CHILE'S NAVY.—*The West Coast Leader*, of Lima, Peru, publishes the following extract from *The Standard*, of Buenos Ayres, with reference to the Chilian Navy: "A telegram tucked away in an obscure corner of yesterday's issue contains some relatively momentous information from a naval point of view. It is a statement that the British Admiralty is selling to Chile three warships, which will put the Chilian Navy, always remarked for its efficiency and high spirit, in a strong position. One warship to be received is a dreadnought, to replace the *Almirante Latorre*. Such a ship would no doubt be selected with a view to conforming to the *Almirante Cochrane*, which was the pattern vessel, while the *Latorre*, with the friendly permission of Chile, was retained by Great Britain on the outbreak of the war, and is now H. M. S. *Canada*. Presuming that the addition will be of the same type, this will mean that Chile will possess two capital ships which, even with all allowance for developments during the war which have made some previous powerful units semi-obsolete,

remain very powerful and efficient fighting machines and infinitely the most powerful belonging to any South American state. Their description is as follows: 28,000 tons displacement; length, 625 feet; beam, 92 feet; draft loaded, 28½ feet; i. h. p., 37,000; speed not less than 23 knots; complement, 1000 men; coal, 1200 tons; armament, ten 14-inch 50-caliber guns in armored hoods; sixteen 6-inch Q. F.'s and many small guns, with four 21-inch torpedo tubes. The steel decks are 4 inches thick tapering to 2½ on crown, side 4½ inches, and belt 9.6 inches. This is a type of vessel so formidable that the two might be well considered equal to the three Brazilian battleships and much superior to the Argentine ships built four years before.

"The cruisers *Southampton* and *Dartmouth* are the other two naval units which, according to this report, are to be sold to Chile. Both have a sea speed of 26 knots with eight 6-inch guns. They are most valuable ships of some 5400 tons each, great offensive power and high speed; and here, again, there is nothing like them in any other South American Navy."—*The Naval and Military Record*, Apr. 7, 1920.

TURKISH PROBLEM.—President Wilson's rejoinder to the Allied note with regard to the status of the United States in the Turkish Treaty negotiations shows that while the strength of the arguments of the Allies for the retention of the Turks in Constantinople is recognized, the arguments against it are far stronger, and contain certain imperative elements which it would not seem possible to ignore. It does not seem advisable in the present circumstances that the United States should be represented at the Conferences, but as the United States Government is vitally interested in the future peace of the world, the government should frankly express its views on the proposed solutions of difficult questions connected with the Turkish Treaty.

Comments on the territorial phases of the question and the entire economic program are deferred, but the note says it is the understanding of the United States that whatever territorial changes or arrangements are made in the former Ottoman Empire, such changes or arrangements will in no way place American citizens or corporations of citizens, and corporations of other countries, in less favorable situation than those of any Power signatory to the Treaty.

The note adds: "The United States see with pleasure the representation of Russia on the Council which it is proposed to establish for the government of Constantinople and of the Straits. The United States Government is convinced that no arrangement could have been just unless Russia's vital interests are protected, and unless Russia, when she has a recognized government, may assert her right to be heard with regard to decisions now made."

President Wilson expresses pleasure that the question of the passage of warships through the Straits and the régime of the Straits in war time is still under consideration, as the United States Government is convinced that no final decision can be reached without the consent of Russia.

The note suggests that the part of Eastern Thrace outside the Constantinople zone should become part of Greece, except the northern part, which is clearly Bulgarian in population, and fair dealing demands that Adrianople, Kirk Kilisse, and the surrounding territory should become part of Bulgaria, whose claim is worthy of the most serious consideration, not only on historical grounds, but because she has been compelled to surrender territory and many thousands of Bulgarians on her western boundary on no other grounds than the doubtful grounds of securing a strategic frontier for Serbia.

As to the future of Armenia, the feeling is expressed that special rights over Lazistan hardly assure that access to the sea which is indispensable to Armenia's existence, and it is hoped the Powers will give Trebizond to Armenia.

With regard to Mesopotamia, Arabia, Palestine, Syria, and the islands, the United States Government suggests that Turkey should place these provinces in the hands of the Great Powers to be disposed of, and reserves its opinion regarding Smyrna, as the question is too important to decide with the limited information at its disposal.

The note asks for further information regarding the economic questions, and expresses confidence that they will be conceived in a spirit of fairness for the commercial interests of victor, vanquished, and neutral.—*The Naval and Military Record*, Apr. 7, 1920.

THE PORTUGUESE NAVY.—The acquisition by Portugal of six sloops from the British Navy is a move which other navies of the minor Powers may be expected to follow. There is a better opportunity for these lesser navies to add to their material now, in a simple and cheap way, than there ever will be again for a generation at least. The sum paid for the six sloops is not disclosed, but it cannot have been anything like what it would have cost to build such vessels at the present time. Even if Portugal paid our government as much as the sloops originally cost in 1915, the price would still be cheap, as the construction of this class of vessel on the mass production principle—about 120 were ordered altogether—made for a very low individual cost. The addition of the *Acacia* and her sisters will doubtless be welcome in the Portuguese Navy, which has only four cruisers or gunboats under 25 years of age. For all kinds of general service, the sloop class proved invaluable in the war. The reference by Lord Jellicoe to the despatch of the *Acacia* to Bear Island and Spitzbergen to search for a reported enemy submarine base in July, 1915, is typical. One sloop towed a monitor from England to Mudros; another convoyed a liner for 400 miles at 17 knots; and all did well at mine-sweeping.—*The Army and Navy Gazette*, Apr. 10, 1920.

VAST FORTIFICATIONS OF METZ.—An article by Colonel E. M. Blake, C. A., in the *Journal of the United States Artillery*, speaking of the modern Metz fortifications, says that the turrets containing the Krupp guns can be manned and supplied without ever exposing a man, as all batteries are connected with other works of the "Feste" by deep subterranean galleries. Miles of these galleries have been cut, with a cross section and grade to allow men to circulate rapidly when needed, and one finds complete kitchen, bakeries, bathing and toilet rooms for the garrison, large recreation rooms, electric lighting and power, and a complete system of forced draft ventilation.—*Scientific American*, Apr. 24, 1920.

GERMANY'S "HONOR."—When the war was over, many people in this country hurriedly rose up and made urgent and persistent appeals that nothing should be done that might give the impression that we were seeking to humiliate Germany; her rulers, such as they are, begged that they might not have any conditions of peace offered for their signature, the signing of which might be regarded as offensive to *die Ehre Deutschlands;* certain English fools in conspicuous places have put down the recent attempts at revolution in Germany as the result of "petty humiliations" put upon that country; while those of us who have expressed the belief that Germany's army had suffered no sensible diminution, that she was almost as well off now as at any period of the war in guns, aeroplanes and munitions of all kinds, were set down as alarmists. According to the terms of the Treaty of Versailles, Germany should have at the present time no more than 204 three-inch guns, no military aeroplanes of any kind, while within the next ten days her armed forces under the same agreement should have been reduced to 200,000 men all told. It is now reported from Paris that no fewer than 12,000 three-inch field guns have been unearthed by the Inter-Allied Commission in Germany—3500 of these in the neighborhood of Berlin—while she still possesses 6000 aeroplanes! The German Govern-

ment have recently asked permission to send troops into the neutral and occupied zones, apparently believing that the Allied governments are composed of fools. This is no time for granting Germany's requests or listening to her talk about honor, but for insisting on the fulfilment of the terms of the Treaty accepted by her.—*The Army and Navy Gazette*, Apr. 10, 1920.

COOLING THE MILITARY TANK INTERIOR.—The high temperature which developed in our fighting tanks during the summer months in France was exceedingly trying to the men of the Tank Corps. In the new Mark VIII tank, these conditions have been remedied by placing the motor in the rear and building an airtight bulkhead between the motor and the forward fighting compartment. This shuts off gases and the greater part of the heat of the engine. By means of a fan fresh air is drawn in and forced into the fighting compartment through a steel pipe. The air thus introduced gradually passes out through the peepholes and every available opening, and thus not only is the heat reduced, but a complete circulation of air is assured.—*Scientific American*, Apr. 24, 1920.

NEW METHOD OF GUN CONSTRUCTION.—The Bureau of Ordnance, Navy Department, is having the Naval Gun Factory, Washington, D. C., equipped with the necessary machinery for the manufacture of medium caliber guns by the "Radial Expansion Method." In manufacturing guns by this method, an entire gun is made of a single forging. The rough forging is subjected to internal hydraulic pressure, and the elastic limit of the metal is raised by straining the metal successively beyond its elastic limit. When the hydraulic pressure is removed, the metal of the gun forging is left in a state of initial strain, similar to what was effected by the older method of building up guns assembled by the shrinkage method of gun construction, i. e., the outer layers of metal of the gun are left under extension, and the inner layers of the metal of the gun are under compression.—*Scientific American*, Apr. 24, 1920.

THE PRESIDENT AS COMMANDER-IN-CHIEF.—The President is the Commander-in-Chief of the Army and Navy and the militia when called into the service of the United States. He can order the army and navy "anywhere he will if the appropriations afford the means of transportation." Of course, the instrumentality which this power furnishes gives the President opportunity to do things which involve consequences "that it would be quite beyond his power under the Constitution directly to effect." Under the Constitution only Congress has the power to declare war, we are reminded by Mr. Taft, but with the army and navy the President "can take such action as to involve the country in war and to leave Congress no option but to declare it or to recognize its existence." This was the charge made against President Polk in beginning the Mexican War. War as a legal fact, it was decided by the Supreme Court in prize cases, can exist by invasion of this country by a foreign enemy or by such an insurrection as occurred during the civil war without any declaration of war by Congress at all. It is only in the case of a war of "our aggression against a foreign country that the power of Congress must be affirmatively asserted to establish its legal existence." In his volume, "Our Chief Magistrate and his Power," Mr. Taft says further:

"What constitutes an act of war by the land or naval forces of the United States is sometimes a nice question of law and fact. It really seems to differ with the character of the nation whose relations with the United States are affected. The unstable condition as to law and order of some of the Central-American republics seems to create different rules of international law from those that obtain in governments that can be depended upon to maintain their own peace and order. It has been frequently necessary for the President to direct the landing of naval marines

from United States vessels in Central America to protect the American consulate and American citizens and their property. He has done this under his general power as Commander-in-Chief. It grows not out of any specific act of Congress, but out of that obligation, inferable from the Constitution, of the government to protect the rights of an American citizen against foreign aggression, as in the Kotza incident, cited by Mr. Justice Miller in the Neagle case. In practise the use of the naval marines for such a purpose has become so common that their landing is treated as a mere local police measure, whereas if troops of the regular army are used for such a purpose, it seems to take on the color of an act of war.

"Thus it would be difficult to explain the landing of our army in Vera Cruz by force as anything but an act of war to punish the government of Huerta in Mexico for its refusal to render what was deemed by President Wilson as a proper apology for a violation of our international rights in the arrest of some of our sailors. This act was committed before authority was given by Congress, but the necessary authority for it had passed one House and was passing another at the time, and the question as to the right of the executive to take the action without Congressional authority was avoided by full and immediate ratification.

"In Nicaragua, in my administration, an insurrection had led to the immurement of American citizens by *insurrectos* and the threatened destruction of American property. The President of Nicaragua, whom we had recognized and whose minister we had received, called upon us to protect our own citizens and their property because he was unable to render them the protection which their treaty rights gave them. This led to the landing of marines and quite a campaign, which resulted in the maintenance of law and order and the elimination of the *insurrectos*. This was not an act of war, because it was done at the request and with the consent of the lawful authorities of the territory where it took place.

"As Commander-in-Chief and in taking care that the laws be faithfully executed, President Cleveland sent General Miles to Chicago to remove the obstruction to the passage of the mails and of interstate commerce which Debs at the head of the American Railway Union was effecting by violence and other unlawful means. This was the case where Governor Altgeld sought by protest to keep the army out of Illinois, on the ground that until he or the legislature requested it the President had no right to send it into the state for the purpose of suppressing disorder. President Cleveland and Attorney-General Olney earned the gratitude of all lovers of peace and good order by the firm stand which they took in this matter and in maintaining what the Supreme Court had so often decided, that every foot of land within the jurisdiction of the United States, whether in a state or territory, or in the District of Columbia, is territory of the United States upon which the laws of the United States can be executed by the President with all the forces which he has at his lawful command; that there is a peace of the United States a violation of which consists in forcible resistance to federal laws. Mr. Cleveland did not have to consult Governor Altgeld as to whether he should send an army to Illlinois to see that the peace of the United States was preserved and that the federal laws were faithfully executed there. The full legality of President Cleveland's action in this regard was sustained by the unanimous judgment of the Supreme Court in the Debs case."—*Literary Digest*, May 1, 1920.

RANGE AND VISIBILITY.—One lession drawn from what happened at Jutland has been that superior speed and guns of longer range and power than those of the enemy afforded insufficient protection to the British vessels, and that more armor was necessary. The result may be said to be seen in the *Hood*, but the question will still arise, although the subject

is far too big to be treated in a short note, whether, if the tactics for which the ships were built had been observed, the design would not have proved satisfactory, as it may be said to have done in the Falklands action. Admiral Sturdee in that action, by his deliberate policy of keeping at long ranges, knocked out the German ships without giving them a chance to do his squadron any real damage. No doubt the battle was somewhat prolonged thereby, but the end was the same, and the remarkable fact was that not a man was killed or wounded in Sturdee's flagship, and in all the other British ships only ten men were killed or died of wounds. The obstacle to the similar employment of the battle-cruisers at Jutland was the low visibility which prevails for most of the time in the North Sea, as Captain Chatfield pointed out a few days ago at the Institution of Naval Architects. On the other hand, the battle-cruisers were not primarily built for battle in the North Sea, nor is it likely that for some time to come there will be any more fighting in its waters.—*The Army and Navy Gazette*, Apr. 17, 1920.

TAKING CHANCES.—It is high time that we stopped taking gamblers' chances with our national safety. We insure our buildings, why not our country? Especially as by Universal Training we can insure it on the endowment plan—the plan which not only provides insurance but returns the premiums with interest. The truth is that we owe our national independence and safety to good luck and 3000 miles of water.

We won the revolution: because England was involved in European wars and because of the difficulties, in the days of sailing vessels, of operations across an ocean 3000 miles wide; also because many of the great popular English leaders were opposed to the policy of King George III and his minister, Lord North.

The war with France in 1802 was on paper only. In the war of 1812, England was under much the same difficulties as in the Revolution. Our capital was burned and the result was little better than a draw. We quickly won the Mexican War because the handful of disciplined troops and trained officers that we had were sufficient. In the Civil War, both sides were unprepared and the victory fell, as was inevitable, to the side that had the navy and the factories.

The war with Spain was really a naval war and was won by us because our navy was sufficiently prepared for the particular emergency while the Spanish ships were but death traps for their gallant sailors.

Our three serious wars—the Revolution, the war of 1812 and the Civil War—could have been successfully terminated in short order, with small loss of life and at trifling cost by a single army corps (or less) properly trained, led and supplied. Lack of preparation dragged these wars out for years, left the result to mere chance, and cost us dear in blood and treasure.

Shall national defense continue to be neglected on any theory that there will never again be war? The April issue of the *National Service* magazine chronicles some fourteen wars now in progress. The suggestion was made in the House of Representatives that it is unnecessary to provide for national defense because we always have the veterans. The slogan of this proposal is "Let the veterans do it; they know how." Apart from the obvious unfairness of any such proposal, it is clear that if the veterans are to be drafted to fight our future wars the necessary draft law should be passed at once, because everyone has learned the folly of waiting to prepare until once war is declared.

It was for the principles enunciated by the Senate bill for Universal Training, as discussed elsewhere in this issue, that the Military Training Camps Association and others contended *before* the war. Under the general apathy toward questions of national defense then prevailing, the

best that could be accomplished was the giving of a month's training to some 22,000 men, chiefly at their own expense, in the civilian training camps of 1913, 1914, 1915 and 1916.

Though Universal Training legislation was drafted long *before* the war, the selective draft act was not passed until May 18, 1917, or nearly six weeks *after* war was declared and the first drafted men from the 500,000 quota did not reach camp until October of 1917, and the last until February, 1918. It was not until July, 1918, that the first 150,000 men were ready for battle in France. Within three months thereafter, that is by October, 1918, we had already about broken down in replacements—both officers and men—and men who had never fired a rifle or worn a gas mask were being fed into the firing line to sacrifice their lives often unnecessarily. A little more fighting and our army would have been made up chiefly of untrained men. Our men fought with foreign artillery, machine guns, ammunition, tanks and airplanes, and were otherwise largely supplied by foreign help and with foreign motor trucks. The war was over, thanks to the tenacity of the Allies and the moral and industrial collapse of Germany, before our munitions, contracted for at staggering expense, could be produced and transported.

Our program was to land 4,000,000 men in France, with supplies at the rate of 25,000 tons a day for each million men, or an ultimate total of 100,000 tons a day. At the close of the war we had over 2,000,000 men in France, but had never landed an average of more than about 26,000 tons of supplies a day, though we had not yet really begun to ship artillery, cannon, ammunition and tanks and were far behind in requirements for motor trucks, railway rolling stock, engineering material, animals and forage.

Let us stop risking our national safety and insure it by an adequate and American system of defense.—*Scientific American,* Apr. 17, 1920.

DREADNOUGHTS, ZEPPELINS, AND U-BOATS.—*An Abortive German Adventure of 1916: How Sunderland Escaped Bombardment.*—The fact that little or nothing was heard during the war of German airships and submarines co-operating with the High Sea Fleet gave rise to a belief that no serious attempt was ever made to put such a plan into execution. This supposition is, however, incorrect. Twice, at least, elaborate schemes of joint action and mutual support by surface ships, U-boats, and Zeppelins were framed. The first occasion was in May, 1916, when it was decided that the battle-cruisers, with the main body in support, should bombard Sunderland. In the expectation that British forces would at once emerge to intercept the raiders, sixteen submarines had previously been stationed at points favorable for attaek. Several were in the vicinity of Scapa Flow, one was off Moray Firth, an entire flotilla lay near the Firth of Forth, several boats were off the Humber, and the remainder north of Terschelling Bank. Six airships were to be strung out across the North Sea between Scotland and Norway, and others were assigned to a line of patrol off the East Coast, extending, from a point midway between Harwich and the Hook, as far north as the Firth of Forth. To the success of this plan, however, fine, clear weather was essential, and, as day after day the conditions remained unfavorable, it was eventually decided not to proceed with the Sunderland enterprise. In its place a sweep of enemy and neutral shipping was to be undertaken in the Skagerrak, and it was whilst the fleet was on its way to make this raid that it fell in with the British battle-cruisers and the battle of Jutland developed.

In the following August, when the damaged German battleships had been repaired, the original plan was revived, with Sunderland again as the objective. As the *Derfflinger* and *Seydlitz* were still in dockyard hands, and the *Hindenburg* was not yet completed, the German battle-cruiser

squadron (comprising only the *Moltke* and *Von der Tann*) was temporarily reinforced by the *Bayern* (armed with 15-inch guns and just commissioned), *Markgraf*, and *Grosser Kurfürst*. In conformity with the lessons learned in the previous May, when no U-boat successes had been obtained, the distribution of these craft was modified. The boats were drawn up in three lines—the first in a position northeast of the Tyne, the second off the Humber, and the third (consisting of boats from the Flanders flotilla) west of Terschelling. Although the exact number of submarines taking part in the August operation is not known, it is believed that about twenty were present. Ten to twelve Zeppelins took up positions corresponding to those they were to have occupied on the eve of Jutland. As each Zeppelin and U-boat was equipped for W/T signalling, the German commander-in-chief believed that he might count on receiving timely news of the approach of hostile forces from any direction.

The plan, according to Admiral Scheer, was as follows: The High Sea Fleet was to weigh on the evening of August 18 and steam in the direction of the English coast, "so that the line of U-boats might come into action, if required." If no encounter with the enemy took place and the line of retreat was open, the ships were to continue their advance and bombard Sunderland at sunset. When the bombardment was over the fleet was to return to Germany, whilst the U-boats were to close in ready to attack British naval forces which were expected to come up in consequence of the bombardment. In his description of what followed, Admiral Scheer contradicts himself more than once, but he does make it clear that he had no intention of fighting a second Jutland. So many precautions were taken that the projected expedition must have seemed to him devoid of risk, and no doubt he congratulated himself on having planned a scheme that would give excellent results from the propaganda point of view and yet be carried out in absolute safety.

But the plan, perfect as it was in theory, did not work so well in practice. The fleet duly sailed at dark on August 18, and the submarines and airships were all at their stations at dawn on the 19th. Admiral Scheer was not aware, however, that the Grand Fleet had sailed on the previous day for a sweep in southern waters, Admiral Jellicoe's suspicions having been aroused by reports of the presence of an unusually large number of submarines in the North Sea—a phenomenon which had been noticed shortly before Jutland. So the Grand Fleet came out to investigate, nor had it long to wait for evidence of what was in the wind. At 7.55 p. m. it passed through the first line of German submarines, one of which fired at a destroyer screening the *Iron Duke*, but missed. The fleet was promptly warned by signal, and thus the factor of surprise, on which the Germans were counting so heavily, was eliminated at the outset. Early on the 19th the *Nottingham*, whilst zigzagging at high speed ahead of the battle-cruisers, was hit by two torpedoes, and half an hour later received a third, which proved fatal. "From 8.24 a. m. onwards," wrote Admiral Jellicoe, "Zeppelins were frequently in sight," and "at 10 a. m. Commodore Tyrwhitt, who was at sea with the Harwich force, reported himself also being followed by a Zeppelin. He stated later that his force was shadowed by airships during the whole period of daylight on the 19th." Our directional wireless stations had also identified a total of at least ten airships, which "appeared to stretch right across the North Sea, as, in fact, they did. By now Admiral Jellicoe had formed a correct appreciation of the German plan. But in the meantime something had happened to put Admiral Scheer out of conceit with his "hussar stroke."

At 5.30 a. m. on the 19th the High Sea Fleet fell foul of a British submarine, and an hour and a half later the *Westfalen* was torpedoed amidships. Though heavily damaged, she was able to return to the Jade under her own steam, narrowly escaping a second torpedo on the way home. Both torpedoes had been fired by *E-23* (Lieut. Commander Turner), and immediately his quarry was out of sight he rose to the surface and signalled

the enemy's position to Admiral Jellicoe. Very probably this signal was intercepted on board the German flagship; at all events Scheer's movements at this period bear witness to his indecision whether to continue the advance towards Sunderland or turn about and make for home. At one time he thought of turning south in order to fall upon the Harwich force which his airship, *L-13*, had reported to be coming north, and he did, in fact, alter course with that intention. Meanwhile in the Grand Fleet an encounter with the enemy was expected at any moment. Admiral Jellicoe considered the meeting so certain that he arranged the distribution of gunfire of the Battle Fleet. But the Germans had already turned back. "At 2.35 p. m.," writes Admiral Scheer, "course was altered to ESE., and we began our return journey. There was no further prospect of coming up with the enemy in the south [as a matter of fact Commander Tyrwhitt at that very moment, viz., 2.35 p. m., was steering for a position to the northwest of Terschelling in the hope of being able to deliver a night attack on the German fleet], and it had grown too late to bombard Sunderland."

So the grand project came to nothing. The trap had certainly been well baited, and we lost another light cruiser, the *Falmouth;* but, considering his far-reaching arrangements and his lavish expenditure of torpedoes during the 24 hours the operations had lasted, the results must have been most disappointing to the enemy. Needless to say, there were the usual imaginative reports from U-boats of having sunk or damaged other British ships, the best being that of *U-65*, which deserves to be quoted. This boat claimed to have run right into the Grand Fleet at dusk on the 19th. "Pushing forward at full speed, *U-65*, at an estimated range of 3000 meters, fired four torpedoes at the leading battle-cruiser. The U-boat was half-submerged, and the observers were in the conning-tower. After a lapse of some three minutes . . . . a column of fire, 20 meters wide and 40 meters high, rose behind the after funnel of the last battleship, and was visible for about a minute, while the funnel itself, white hot" (a characteristic touch!) "was clearly discernible through the flames. At the same time there was a violent escape of steam. The fire lasted one minute. When the ship became visible again only the hull, without funnels or masts, was to be seen, whereas the silhouettes of the ships near by, with their funnels and masts, were clearly visible." As no British ship other than the *Falmouth* was torpedoed on this day, the foregoing report was either pure fiction, or the *U-65* had, in fact, hit one of our "dummy" battleships. In view of the pyrotechnic display and the mysterious disappearance of funnels, etc., the latter theory seems quite the most plausible one.

Admiral Scheer's comment on the day's proceedings was as follows: "The disposition of our U-boats in a movable line had met with the desired success (?), and certainly was more advantageous than stationing them outside the enemy's ports of issue. . . . . The reports from the airships were not entirely reliable, chiefly because they were only eight (?) in number, and were expected to keep such a large area in view. Scouting by airships is, in any case, somewhat negative in character, since the fleet is only informed by them that the main hostile fleet is *not* within their field of vision, whereas the important thing is to know where it actually is." A similar enterprise was planned for the beginning of September, but "unfortunately we were prevented from carrying out this plan because unfavorable weather made scouting impossible." This naïve confession of dependence upon such auxiliaries as airships and submarines is characteristic of the false strategical principles that paralyzed the German fleet throughout the war.—*The Naval and Military Record*, Mar. 31, 1920.

MUSTARD GAS.—One of the big secrets of the war is recalled in the award to Dr. J. E. Myers and Mr. Henry Stephen, both lecturers in chemistry at the University of Manchester. It was these two young scientists who discovered the type of mustard gas which contributed appreciably to the German rout in 1918.

"Mustard gas," explained Mr. Stephen in an interview with *The Manchester Guardian*, "was originally discovered by Guthrie, a Scotsman, in 1860. Of course, he was not out for mustard gas then; he was simply trying the action of sulphur chloride on ethylene, and he got something with a burning and scorching action. A German, Victor Meyer, developed the discovery in 1889, and obviously, to my mind, the question of using poison gas was a question upon which they had already made up their minds before the war.

"But," continued Mr. Stephen, "the German process of making mustard gas was entirely different from ours. It was a long and laborious affair with them, fortunately for our lads, because I do not think that there is any doubt that the reason why the Germans used to give a slog every month or every two months was just that they were waiting for fresh supplies of mustard gas each time.

"On the other hand, when our men began making it, it was turned out in such large quantities that our armies could attack with it every day if they so chose. What Dr. Myers and I were asked to do was to find how mustard gas could be made rapidly and cheaply. We began our experiments on November 20, 1917, and by Boxing-day of that year we had solved the problem. The actual mustard gas which was used at the front was made by us for the first time in our laboratories at Manchester University.

"The crude product was tested for toxicity by application to the skin. A slight smear on the forearm caused acute blistering from the wrist to the elbow, and general swelling of the whole arm. Our product—its correct name is dichloridethyl sulphide—was passed on to the Ministry of Munitions, but I don't think it was used on the field until June, 1918.

"The vital fact about our process," concluded Mr. Stephen, "was this, that by it more mustard gas could be made in one day than by the German method in a month."—*The Naval and Military Record*, Apr. 7, 1920.

THE PERIL OF THE STRAIGHT-STEM SHIP.—We have become so much accustomed to seeing the straight stem on merchant shipping that the presence of the old, curved, clipper stem on a steamship, unless she should chance to be a yacht, has come to stand as the mark of a ripe old age. And yet, if the advice of Captain H. F. Young, of the Board of Trade, given at an annual dinner of British shipmasters be followed, we may yet see a return, if not to the curved clipper bow, at least to a stem inclined forward at fifteen to twenty degrees. The object of the change, as recommended by this Board of Trade official, would be humanitarian; for he believes, and we fully agree with him, that the change would result in the saving of thousands of lives. In the event of collision, the straight stem means that the stricken vessel will be pierced below the water-line. But if the ship that strikes has a forward-inclined stem, the blow will be taken first by the upper works and topsides and, in the majority of cases, the momentum of the striking ship will be absorbed before the rent has extended down the water-line. It is stated that several leading steamship companies are already adopting these suggestions. We are not sure that anything will be lost on the score of appearance. The fast cruisers built by the British during the war have the inclined stem and, if anything, it adds a touch of smartness to the appearance of the vessel. The White Starliners have always had a slightly inclined stem. It is quite conceivable that, once introduced, it will rapidly become popular.

Nor is the protective effect of the inclined stem limited to a ship that is rammed. In many, if not in the majority, of collisions, the crumpling up or twisting aside of the inclined bow, will not extend below the water-line, and the chances of the ship reaching port will be measurably increased. Furthermore, there is a tendency, just now, to follow the lead of

naval constructors in the matter of providing wide, flaring bows to assist a fast ship in driving through head seas. A bow of this character would absorb more of the energy of collision than the old wedge bow, and the chances of damage would be proportionately reduced.—*Scientific American*, May 1, 1920.

LONG-RANGE GUNS.—Great interest has been excited in naval and military circles by the latest news concerning the Delamare-Maze gun, a super-velocity weapon which is said to range twice as far as the German guns that shelled Paris in 1918. Lieut. Delamare-Maze, a French engineer, laid the plans before his government in December, 1918. The experts, including Marshal Foch, were so impressed with the possibilities of the invention that they ordered an experimental gun to be built forthwith. This was done, and as a result of the trials the French Government has purchased the entire French rights of the invention. It is well known that the British authorities for months past have been deeply interested in the new gun. As Mr. Lloyd George stated a fortnight ago, the War-office is in close touch with the inventor, and "experiments are now proceeding." It is refreshing to learn that the old spirit of conservatism which in pre-war days led our government to turn down so many promising ideas no longer rules in Whitehall. There is a conflict of evidence in regard to the powers of the new gun. It seems, however, to be established that M. Delamare-Maze has succeeded in achieving a muzzle velocity of 4625 foot seconds, and a range of 150 miles. The caliber of the trial gun is not known, but the French papers state that the system can be applied to existing guns at trifling cost, and is adaptable to all categories of artillery, from the mitrailleuse up to the heaviest ordnance mounted, afloat or ashore. The invention must therefore differ fundamentally from the German gun, which was merely a 15-inch naval piece lined down to 8.2-inch bore, and fired with an abnormally heavy charge to develop the requisite velocity. During the war British designers who tackled the problem of producing such guns found that there were no insuperable difficulties, and had a definite use for them appeared, guns of this type would certainly have been built for the British forces. But, as an artilleryman wrote in a recent issue of *The Gunner*, it is difficult to see how they could be made to pay. An aeroplane could multiply the range by at least five, the weight of the shell (or bomb) by at least five, and be much surer in its aim and infinitely cheaper in its cost.

Still, if the new French gun really posseses the qualities with which it is credited, its sphere of utility will not be confined to military operations alone. A warship armed with guns of this description could bombard an enemy's inland cities without exposing itself to direct return fire from coast batteries. In co-operation with spotting aircraft the super-velocity gun might even play a rôle in fleet engagements, though there would be little or no chance of hitting a moving ship beyond visible range. *The Times* acclaims the new gun as a portent in the military history of the world which enormously strengthens the case for the League of Nations. In future war, we are reminded, there will be practically no limit to the amount of destruction of life and property which an enemy will be able to inflict. "London, for instance, could be bombarded by batteries of the new guns stationed at Zeebrugge, or mounted on ships cruising far from land in the North Sea; and at the same time be bombed by a fleet of thousands of aeroplanes, carrying far heavier supplies of far more destructive explosives than anything yet seen." It is a hair-raising prospect, and doubtless a powerful argument for the abolition of war, but we are not at all sure that England would be the only sufferer in a war fought principally with long-range guns and aeroplanes. The latest information touching the Delamare-Maze gun is that the propelling charge is ignited

in a special chamber, where a tremendous gas pressure is developed and brought to bear on the projectile in the bore through two barrels at one side of the gun. As the gases escape towards the rear, the reaction nullifies the recoil of discharge. This is a most valuable feature of the invention, since it should enable the gun to be mounted on a carriage of very simple design, and would also facilitate the mounting of the gun on shipboard. It says much for the loyalty of France towards her British Allies that she has done nothing to prevent our acquisition of what may prove to be one of the most epoch-making improvements in the history of ordnance.—*The Naval and Military Record*, Apr. 7, 1920.

"CHEMICAL WARFARE MUST BE PURSUED."—The recently expressed opinions by military authorities on the future of chemical warfare emphasize that the nation which develops the most extensive modifications in the art of war will have a great advantage in the next conflict. These opinions are that "chemical warfare must be pursued," and to what extent is indicated in the following passages bearing on the future of chemical warfare taken from a memorandum issued by the British Secretary of State for War relating to the army estimates for 1920-21. The memorandum reads, in part:

"So long as there is any danger of other nations continuing these methods of warfare, research and experiment in chemical warfare must be pursued. Research must not only be directed towards the gases and apparatus likely to be employed in the future, but also towards protection against all possible gases. Training in the use of gas will be confined to appropriate branches, but training in defensive measures will include the whole army. We must, unfortunately, continue our studies of what is known as chemical warfare. No nation has renounced the use of poison gases as the result of the Peace Conference. There are nations whose word we could not respect if they did renounce it. It is essential to study the offensive side of the chemical warfare if we are to be prepared for defence. The great importance of adequate defensive appliances arises from the fact that preparations for the offensive use of gas can be made in peace time with great secrecy, and may have far-reaching and even fatal results in the early stages of a war.

"For these reasons it is necessary to make adequate provision for research, experiment and design in connection with war material. It is equally necessary to avoid overlap, duplication of effort and the setting up of military institutions for scientific research which can better be done by existing civil institutions. It is our policy to farm out to civil scientific institutions, such as the universities, the National Physical Laboratory, the Imperial College of Science and Technology, etc., all pure research that can profitably be farmed out, and, generally speaking, to restrict military institutions to applied research and the preliminary design of apparatus. The question of overlap has been dealt with by an influential committee, under the presidency of Mr. Balfour, in connection with the Department of Scientific and Industrial Research. This committee has recommended, and the Cabinet has approved, the establishment of four co-ordinating boards in connection with research for the fighting services, for radio-research, chemistry, physics and engineering. The action of these boards should lead to the detection of overlap, where such exists, and its elimination, and also the dissemination of information."

General Sir Louis Jackson, of the British army, speaking in London on March 7 on the futility of expecting reduction of armaments, said: "With regard to the use of gas in future wars, there is no more reason to forbid its use than to forbid the use of rifles. There are gases which kill painlessly, and it is easy to conceive cases in which it would be more humane to use gas than explosive shells. It might be possible to come to some agreement that no gas should be used which would cause unnecessary suffering. Commercial progress and prosperity in the twentieth century

will depend upon chemistry, and chemical productions must have a great effect on all future wars."

General Debeney, director of the French College of War, expressing his conviction that gas will play an important part in future wars, stated at Paris on February 19:

"Should war begin again now, aviation, and especially gas, would play one of the most important parts. The progress of aviation would make the rear of each front, and very far in, extremely dangerous, and the progress of chemistry would permit the use of gas on zones of such an extent that it cannot be imagined. But this would be the sense in which the war would develop, much more than the immediate effect that would take place from the beginning of hostilities. Making gas is naturally rapidly done, because all the manufactures of chemical products—still so numerous in Germany—can be requisitioned; but to make airplanes is much slower.

"Thus, while there will be people at work to prepare ways of attacking, it is evident that others will be preparing ways of protecting themselves, and that means once again the race between the novice agents and the defense against those agents. The defense against gas seems to be more difficult than against airplanes. I believe that, against airplanes, the anti-aircraft artillery is susceptible of making rapid progress, and perhaps in that very instance gas will be one of the best ways if, with appropriate shells, the air can be poisoned all around the attacking airplane. It would be much more effective to create, for example, a sphere of poisoned air a mile around the airplane, instead of trying to hit the machine directly with bits of the shell. Concerning the defense against gas, I expect that our chemists will find some "anti-gas" neutralizing other gas. But until further order, I am afraid more of gas than of airplanes, and this because there are no products which can be easily made in secret. We will be able to control the cannon and ammunition works in Germany, but it will be the worst job to watch the manufacturers of chemical products. A laboratory secret, a procedure carefully kept secret, and these manufacturers become tomorrow war toxic products makers. This is the main danger.—*Army and Navy Journal*, Apr. 24, 1920.

DEPTH CHARGES AND MINES.—Throughout the war the officers and men of the British submarine service held the German depth charge in profound contempt. Our patrol boats working in and about the Bight were not in the least perturbed by the charges which were often rained upon them by the enemy, and it is doubtful whether a single British submarine was destroyed by such weapons. Obviously the Germans failed to grasp the importance of the depth charge. Admiral Scheer speaks with pride of the latest type of German charge, which weighed 50 kilos, that is 110 pounds. Yet we were using charges of five times that weight, and when the armistice supervened a new type, weighing nearly half a ton, was in process of manufacture. German mines, on the other hand, were exceptionally formidable. According to Admiral Scheer, at the beginning of hostilities three types of mine were employed by the German Navy, with charges of 155 pounds to 330 pounds, which were effective at depths from 295 feet to 377 feet. Ultimately a mine was evolved capable of being used at depths of 1130 feet. The following types were introduced during the war: An anti-submarine mine, charged with 44 pounds of explosive, and serviceable to a depth of 311 feet; a "torpedo-mine," which could be ejected from a submarine traveling below the water, with a charge of 210 pounds, and a depth limit of 656 feet; a mine specially made for use in UC-boats, containing a charge of 265 to 440 pounds, effective to 1200 feet; and a special mine made for the first big U-minelayers, which, however, was not made in large quantities. It is interesting to learn that the Germans had devised a paravane, or an apparatus suspiciously like it, judging from Admiral

Scheer's description. "This was attached to the bows, and was intended to cut the mine cables before the boat struck the mine. It was found of great use." First adopted for sweepers, this gear was afterwards supplied to all classes of ships. But one's confidence in the accuracy of Admiral Scheer's description of material is somewhat shaken by certain glaring misstatements of which he is guilty. For instance, speaking of the fast cruiser-minelayers, *Brummer* and *Bremse*, which raided the Scandinavian convoy in October, 1917, he refers to them as having "originally been constructed in German shipyards for the Russian Government," whereas both vessels were designed after the outbreak of war. Admiral Scheer appears to have confused them with the *Pillau* and *Elbing*, two light cruisers laid down for Russia by the Schichau firm, and appropriated to the German Navy in August, 1914. He states that the *Brummer* and *Bremse* could each carry 360 mines, they were well armed with 5.9 guns, and had a speed of about 30 knots. Both, it will be recalled, were scuttled at Scapa last summer.—*The Naval and Military Record*, Apr. 21, 1920.

ITALIAN ARMY REDUCED TO TEN CORPS.—A decree providing for the reduction of the Italian Army to ten army corps was issued by the Italian Government on April 20, according to an Associated Press dispatch from Rome. Provision is made for the reduction of the number of officers and also for the establishment of a uniform system of recruiting for eight months' service.—*Army and Navy Journal*, Apr. 24, 1920.

CURRENT NAVAL AND PROFESSIONAL PAPERS

Shall We Be the Oil Beggar of the World? By Dennison Brown. *Sea Power*, May, 1920.

Sea Power in the Pacific. By Charles E. T. Stuart-Linton. *United Service Magazine*, April, 1920.

The Relation of the U. S. Naval Observatory to the Navy and Shipping Interests of the Country. By Rear Admiral J. A. Hoogewerff, U. S. N. *Journal of The Franklin Institute*, April, 1920.

Detection of Submarines. By Harvey C. Hayes, Ph. D. *American Philosophical Society*, Vol. LIX, No. 1, 1920.

Aeronautic Instruments. By M. D. Hersey. *Mechanical Engineering*, May, 1920.

NOTES ON INTERNATIONAL AFFAIRS

FROM APRIL 10 TO MAY 10

PREPARED BY

ALLAN WESTCOTT, Associate Professor, U. S. Naval Academy

KNOX PEACE RESOLUTION BEFORE THE SENATE

SENATOR KNOX ADVOCATES SEPARATE TREATY.—On May 5 Senator Knox opened debate in the United States Senate on his resolution declaring war with Germany at an end, providing for resumption of trade, and directing the President to negotiate a separate treaty with Germany. In referring to the Treaty of Versailles, Senator Knox declared the peace negotiators should have left the question of world peace to a later conference, at which international law could be codified and an international court established.

It was anticipated that the Knox Resolution would pass the House and Senate, but would fail to be sustained over the President's veto. On May 10 a letter from President Wilson was published urging the Democratic Party to stand firmly in the coming election for the League Covenant without reservations.

WORK OF SAN REMO CONFERENCE

The San Remo Conference of Allied Premiers and Ministers, held during the third week of April and closing on April 27, was concerned with the terms of the Turkish Treaty, the distribution of mandates in the Near East, the settlement of the German indemnity question, and trade with Russia.

UNITED STATES OFFERED ARMENIAN MANDATE.—On April 25 it was announced that the allied premiers had decided to send to the United States Government a formal offer of the mandate for Armenia, and that whether or not the United States would accept the mandate, President Wilson would be asked to determine the frontiers of the new Armenian state. In Washington it was thought that the United States would not take the mandate, but that President Wilson would be inclined to arbitrate the boundary questions.

FRENCH AND BRITISH MANDATES IN NEAR EAST.—San Remo, April 15 (Associated Press).—The Council awarded a mandate for Mesopotamia and Palestine to Great Britain and a mandate for Syria to France.

In placing Palestine under a British Mandate the Council established within the ancient limits of the Holy Land what is called "the national home of the Jews."

The terms of the mandate protect the national rights of Jewish citizens of other countries, that is to say, a Jew of American, British, French or other nationality may retain his nationality, although he is also a citizen of the state of Palestine. The rights of Arabs also are protected, there being 600,000 of them in Palestine, as against 100,000 Jews.

The mandate is limited generally by what is known as the Balfour declaration. British forces have been in occupation of Palestine since the defeat of the Turkish forces by the British Field Marshal Viscount Allenby.

France has been the protector of the Christians in Syria since the Middle Ages, having been designated for the purpose by the Holy See. The question with regard to Syria has been in serious controversy between the French and British governments since the armistice was signed, particularly over the point whether France should have all of what is geographically outlined as Syria, or only certain parts.

A significant feature of the Allies' action on Armenia is that they have asked President Wilson to fix the boundaries even if he refuses the mandate. The offer is being made, perhaps, to emphasize the fact that without a mandatary Armenia would be much smaller than Mr. Wilson wished it to be. The Supreme Council has not been able to set the boundaries, and there has been constant division of opinion because of the question of Erzerum and the surrounding territory. No one has been found who will put the Turkish nationalist forces out of Erzerum, and advocates of a small Armenia assert that it would be useless to give Erzerum to the new state without a mandatary, as the Armenians would not be able to hold it. If the Allies should give the city to Armenia they would be under obligation to deliver it. Not being in a position to do so, they have decided on their present course and have called on President Wilson to help them out of their predicament.—*N. Y. Times,* April 26.

INDEMNITY CONFERENCE WITH GERMANS AT SPA.—At the San Remo Conference it was decided that German representatives should be invited to meet allied envoys at Spa on May 25, in order to discuss the amount and method of payment of the German indemnity. As a preliminary to this conference, a meeting of the British and French premiers at Folkstone was set for May 13.

As for the Spa plans, there are two opposing views. One is that favored by the British Prime Minister, which is to name the total sum of Germany's indebtedness to the Allies and settle the figure once and for all. The other is that backed by the French Prime Minister, who holds that the sums suggested by Mr. Lloyd George, while perhaps representing at first glance what Germany is able to pay in her present condition, yet do not represent what is justly due France and Belgium, nor what Germany will be able to pay when she regains her prosperity.

Between two such points of view the difficulty of naming a lump sum is apparent. The Germans have stated in Berlin that they have their proposals for payments ready, and that they will be in the Allies' hands before May 10.

There is another French argument which will be heard at Spa, namely, that France cannot be content with Germany's promise to pay a lump sum, even if that can be agreed upon, but that the Allies and Germany as well must agree to some form of guarantee which will persuade Germany of the unwisdom of not paying when she is able to do so.

Germany's annual budget provides 5,000,000,000 marks for the discharge of treaty obligations for this year. Not only are the French dissatisfied with the size of this amount, but they point out that the system of taxation by which it was to be raised is not working at all well.—*N. Y. Times,* May 5.

TURKS RECEIVE PEACE TREATY

TREATY PRESENTED ON MAY 11.—The presentation of peace terms to the Turkish delegates was set for May 11, after which Turkey would be given about a month's time in which to consider the treaty. No difficulty was anticipated in securing the acceptance by the present Turkish Government, but its enforcement appeared to present difficulties in view of the weakness of the Constantinople régime against the nationalist movement with headquarters at Angora under Mustapha Kemal.

A summary of the treaty terms appeared on May 8. The treaty provides fully for protection of Armenians, Greeks, and other minority populations within the new boundaries of Turkey. It also provides restrictions upon the power of the Sultan at Constantinople additional to those of the first draft as formulated at London in February.

BRITISH PREDOMINANCE IN CONSTANTINOPLE.—In the Paris *Temps* of May 7 appeared an article suggesting the existence of a secret agreement between England and the Sultan providing for a protectorate over Turkey, "either in an avowed form as in Egypt or in a camouflaged form as in Persia."

Speaking of the Turkish peace terms, the *Temps* says the Turkish Treaty was drafted at London at a time when France was very much occupied with German problems. It says that, on the whole, the Turkish treaty represents a diminution of French interests in the Orient, and makes it plain that this decrease operates to the benefit of England. Referring to the final shaping of the treaty, it says:

"At San Remo the deliberations relative to Turkey were alternated with conversations relative to Germany. It was a bad method and we hope we will not make the same mistake again. If the allied governments proceed to the final business of the Turkish treaty at the same time as the hearing of the German Chancellor at Spa it will be impossible to avoid regrettable complications. Every time the British Government would object to the policy France purposed to follow toward Germany we would hear England trying to obtain supplementary advantages in the Orient. Every time France would try to make her solution prevail in the Orient we would hear it said that England would not aid to disarm Germany or to force them to pay. The two negotiations would be mutually poisoned. That is why they should be successive and not simultaneous."

The *Temps* then says that it is true that the Turkish delegates are at Paris, but that no one knows just what the government they represent amounts to. It goes on to speak of the British domination at Constantinople, which is a very sore point for French diplomacy.

"Last month," says the *Temps*, "a very singular thing happened at Constantinople. The government of the Sultan, wishing to send to Auzavur Pasha arms and ammunition to employ against the Nationalists, the British officer presiding over the Commission of Control was the only one consulted. He gave permission without notifying the French or Italian officials. Also without notifying the French or Italians, a British officer was permitted to establish a shop for the repair of Turkish airplanes.

FIFTH LEAGUE OF NATIONS MEETING AT ROME

PLANS FOR DISARMAMENT.—The fifth meeting of the League of Nations Council was scheduled to meet at Rome on May 15. Arrangements have been made to consider at this conference plans for a program of inter-

national disarmament, for a meeting of the League assembly, and for executing other projects provided for in the League covenant.

LLOYD GEORGE'S LOYALTY TO THE LEAGUE DOUBTED.—London, May 7.—The League of Nations, according to reports in London, is a foundling which some of its foster fathers, who profess to regard it with affection, are in reality striving to starve into a premature decease. Premier Lloyd George is particularly singled out as a politician who, while doing lip service to the League, is working against its success and seeking to substitute for it machinery which he himself has under his hand in the Supreme War Council of the Allies.

These reports were put in striking pictorial form yesterday by a cartoonist, who represented Lloyd George as a theatrical manager in a tall hat and fur coat talking to a child in short skirts carrying a bandbox labelled "League of Nations." Posters on the wall described the "Supreme Council's No. 1 Touring Company presenting a great farcical tragedy known as 'It May Be For Years or It May Be Forever.'" and "Enormous success at San Remo. Opening shortly at Spa.' The young League of Nations' aspirant to theatrical honors was represented as saying to Lloyd George: "But you promised me a part," and Manager Lloyd George as replying: "Yes, Dearie, in the next show, but, good gracious, child, this one may run for years yet."—*N. Y. Times,* May 8.

RUSSIA

TRADE AGREEMENT DEFERRED.—The project for the League of Nations Council to send a mission to Russia to study economic and political conditions has been deferred owing, it is said, to the coolness of the United States toward the plan, the hostile attitude of the Lenine Government, and the unwillingness of the Council to embark on a scheme foredoomed to failure.

Allied plans for reopening of trade also made slow progress at *pourparlers* with Russian delegates at Copenhagen. England refused to let Litvinoff go to London, since he had previously been sent out of the country, and the other Russian delegate Krassin refused to go to England without him. The French delegates withdrew from the conference when the Russians refused to give any consideration to the Russian debt to France. The French pointed out further that the Soviets were trying to use the economic conference to secure political recognition, and that dealings with the Russian cooperatives would be impossible, since the latter had been abolished by the Soviets.

Plans for trade with Russia were later a subject for diplomatic discussions between England and the United States, the new British Ambassador to Washington, Sir Auckland Geddes, declaring on May 8 that they were proceeding satisfactorily. A conference with Russian delegates is to be held later in London.

POLISH FORCES CAPTURE KIEV

POLAND'S CAMPAIGN IN UKRAINE.—During the latter part of April a Polish army, said to include 700,000 troops, undertook a drive toward Kiev, the capital of Ukraine, on a 200-mile front south of the Pripet River. After severe fighting the Poles advanced from the west and southwest

and on May 8 forced the Bolsheviki army to evacuate the city and retreat east of the Dneiper River. The Polish advance then continued towards Odessa on the Black Sea.

Poland's activities in Ukraine were undertaken by virtue of an agreement with the Ukrainian leader Petlura for the stated purpose of freeing the country from Soviet rule. As a reward of victory, Poland will receive control of Ukrainian railways and the sale of her grain.

FRENCH SUPPORT UKRAINIAN WARFARE.—Behind Poland stands France, financially exhausted, it may be, but possessing huge stores of arms and munitions and possessing, too, able and devoted officers to instruct and lead the Polish troops. The worst cause of France's financial weakness is the enormous excess of her imports over exports, and the biggest single import is wheat. That wheat she must buy from countries whose exchange is at an intolerable premium, and that premium ever mounting. If Odessa can be securely held by France's friends, the vast wheat stores of the Ukraine, Europe's granary, would become available to French shippers. Instead of paying in dollars, France would pay in rubles or in Polish money, both far below the French currency.

Such a contingency would be far preferable to the doubtful effects of a Polish occupation of Moscow, which might have the chief result of uniting all Russia in a bitter guerrilla warfare against them. If the Poles can behave reasonably and not offend Ukrainian susceptibilities and take Kiev, Kitchiney and Odessa, France will have gained the greatest victory since Foch's famous counter offensive of July, 1918. True, the Poles are still far from their objectives, but one has only to read the Bolshevist radios to fathom the utter disarray of the Red forces.—Walter Duranty in *N. Y. Times,* May 3.

FRANCO-BRITISH RIVALRY FOR RUSSIAN TRADE.—Paris, May 3.—The Polish victory in the Ukraine is the most important event to Eastern Europe since the Letts, assisted by the able diplomacy of the British Baltic Commissioner, Colonel Tallents, induced von der Goltz and his Germans to evacuate Riga last Summer. Just as that was a success not only for the Letts but for the British, so the Polish victory is a success for France. For there is no good in shutting one's eyes to the evident fact that during the last nine months there has been in progress a duel between France and Great Britain over the body of what was the Czar's empire, fought in the peaceful lists of diplomacy, trade and money instead of on the battlefield. Instead of guns and prisoners, its victories have been in terms of influence gained or commercial and financial agreements signed. With the beginning of this year the advantage was easily on the side of the British. Although Yudenitch and Denikin, whom they had equipped and tried to organize, failed miserably, the Baltic States of Esthonia and Latvia managed, with the help of a British fleet, arms, money and advice, not only to defeat and expel the Bolsheviki and Germans, but even to attain a certain degree of stability. Riga, Reval and Libau, Russia's "western windows," were, for all practical purposes, virtually British ports, and Anglo-Saxon influence was definitely consecrated by financial and commercial agreements between Esthonia, Latvia and a private group of British capitalists.

These agreements, whose equivalent was also reached with Lithuania, gave the British something very like a monopoly in the trade and finance of the Baltic States in return for assistance in cash and the organization of a banking system and of trade in flax and wood, which, with the possible exception of pigs' bristles, were about all that the Baltic States had to export.—*N. Y. Times,* May 5.

FAR EAST

JAPAN ACCEPTS CHINESE CONSORTIUM.—Washington, May 7 (Associated Press).—Japan has withdrawn all objections to the Chinese consortium and accepted the terms as agreed upon by the United States, Great Britain and France.

The acceptance ends a two years' effort by the State Department to provide for the financing of China by representative groups of bankers in each of the four countries. Japan has contended that Manchuria and Mongolia should be excluded from the operation of the consortium, claiming predominant rights in that territory because of proximity. The United States refused to agree to this exclusion.

Japan will have the right to object to loans for any work which she feels will jeopardize her national life or vitally affect her sovereignty. Under this head, it is said, may be included the construction of railroads in certain sections of China, particularly Manchuria.

The amount to be lent under the consortium has not been estimated, but the advance soon of $50,000,000 for railroad and other construction and betterment is expected. Under the terms all loans made by the banking groups, which in the United States include thirty-seven banks in all parts of the country, must be approved by the State Department.

LATIN AMERICA

CABRERA'S RULE ENDED IN GUATEMALA.—On April 16 President Estrada Cabrera of Guatemala and his army surrendered to Unionist troops under Carlos Herrara, after the latter had surrounded the President's stronghold of La Palma. The revolution began on April 9 and quickly forced Cabrera's departure from Guatemala City. If finally successful, it will end the long control of Guatemala by Cabrera, during which he exercised absolute power but brought education and industry to a high plane.

CARRANZA OVERTHROWN.—A revolution against the Carranza Government in Mexico and in support of General Obregon broke out during the second week of April, the important state of Sonora in northwestern Mexico setting up an independent government. Rebel forces and federal troops in various parts of the country subsequently joined the revolt. Juarez was declared in the hands of revolutionists on May 3, and Vera Cruz on May 7.

On May 5 President Carranza issued a 6000-word manifesto in which he declared his determination not to surrender power until the revolution was defeated. On May 8, however, Carranza fled from Mexico City and General Obregon's forces took possession.

REVIEW OF BOOKS
ON
SUBJECTS OF PROFESSIONAL INTEREST

"Memories and Records." By Lord Fisher, Admiral of the Fleet. (Published by George H. Doran Company.)

These two astonishing volumes reveal one of the most remarkable personalities which the British Navy has ever produced.

Americans, to so many of whom he is known, will take enthusiastic interest in Lord Fisher's autobiography which was dictated in rapid-fire fashion as the Admiral stalked up and down in order to give his "thoughts elbow-room." He was apprehensive throughout this process lest the *aroma* be taken from the spoken word. "Better the fragrance of the fresh-plucked flower," he says "than trying to get more scent out of it by adding hot water afterwards."

This document of a most dynamic career is highly scented as the result, and Lord Fisher was often in hot water himself as were others about him. With unbounded humor he delineates many situations involving the official life of the Empire.

There is no doubt that Lord Fisher saw the great war coming. Serving as he did in positions of great and varied responsibility, he was able despite even violent opposition at times to prepare the navy for its inevitable rôle. In 1907, while First Sea Lord, he wrote King Edward VII that "the only thing in the world that England has to fear is Germany and none else." It was during this period that the dreadnought building program was initiated and carried out and almost two hundred warships were scrapped as of no fighting value. It was then, too, that the future battle ground of the British Fleet—the North Sea—was made its drill ground.

Again in 1914 when he was called as First Sea Lord by Winston Churchill, he was responsible for the legislation which produced the enormous war program of 612 ships of all classes. From first to last he emphasized the necessity of going after the enemy in his own waters through the Baltic and driving him, as well, from the flat shores of the Belgian Coast with the co-operation of the army. He was unalterably opposed to the Dardanelles project and to those who believed that "cutting off the enemy's big toe in the East was better than stabbing him to the heart in the West." The decisive theatre of war was in northern waters: he was not to be deterred from that fact. When Lord Fisher, at that momentous session of the War Council in May, 1915, had it made clear to him that the great projects on these waters were at an end and that a

further and grievous drain was to be made on naval resources, he resigned. The recital of the circumstances in his chapter on the Dardanelles is gripping.

For the layman, the narrative of his early years, his reminiscences of kings and princes, his reflections on the Bible, his quotations—above all, his Latin—are wholly absorbing. Broadminded naval officers will revel in his exposition of naval problems and naval education and in his Essentials of Sea Fighting and in many other serious and diverting professional discussions.

Here was a man to whom is accredited may important reforms. For the development of the dreadnought and submarine, the extension of the use of oil as a fuel and of oil engines, to him the British Navy owes much.

Already in popular esteem Lord Fisher takes his place beside Nelson as one of the outstanding figures in English naval history. Certainly he possesses much of the self-reliance, the audacity, and the resourcefulness, of that great commander.

W. T. C.

"Il Potere Maritimo Nella Grande Guerra." (Maritime Power in the Great War.) By Commander Romeo Bernotti, Italian Navy. (Published by Raffaello Giusti, Livorno, Italy.)

This book is an excellent exposition of the experience of various navies, the trials, the problems and the teachings of the World War as well as a masterly analysis of the naval strategy and tactics employed during the war.

Translated into English this work would fill an important place in the "War College Library" on board ship.

The book is divided into four parts as follows: 1st—Preparation for the Great War; 2d—Naval Strategy; 3d—Naval Tactics; 4th—Naval Organization.

In discussing the maritime development of the United States the author lays particular stress upon the value of the Panama Canal as a strongly fortified first-class naval base with openings into the two oceans, an attribute of the canal that is generally ignored in our country. Much that he has to say about our navy makes very interesting reading.

To review this book thoroughly would take more space than can be allotted because it is full of interesting and carefully developed ideas that are of great value to all naval officers, whether they agree with the conclusions of the illustrious author or not.

The second part, Naval Strategy, seems to be especially good in its clear statement of the strategy used in the war and criticism of this strategy. His criticisms are straight to the point and leave no doubt of what and of whom he is criticising.

It is to be hoped that this book will be translated into English for our officers to study.

T. W.

"The Triumph of *NC's*." By Commander C. C. Westervelt, U. S. N., Commander H. C. Richardson, U. S. N., and Lieut. Commander A. C. Read, U. S. N. $3.00. (Published by Doubleday, Page & Co.)

This book contains an interesting and instructive account, valuable to the professional as well as to the general reader, of the genesis, making and flying of the *NC* airboats. This account is of particular interest and usefulness because it is written, not by lookers on, but by three men who were a part, and a very large part, of the whole undertaking.

The story "takes off" from the time that the order was first given for the building of airboats that could cross the Atlantic under their own power not as a flying feat, but as a war necessity due to shortage of shipping; it carries on through the building and testing of the vessels to the actual accomplishment of the flight as an after-the-war demonstration of their suitability for the original purpose for which they were built.

Commander G. C. Westervelt tells, at first-hand, how the *NC* flying boats were originated, designed and built; he also tells of the considerations that entered into the arrangements for the trans-Atlantic flight. Commander A. C. Read, captain of the *NC-4*, tells the story of the trials and tribulations of the "lame duck" from which evolved, through perseverance and skill, the first successful passage across the Atlantic by the air route. Commander H. C. Richardson gives the "log of the *NC-3*," of which he was pilot, in which he details the story of the actual preparations for the flight, the passages from Rockaway to Halifax and Halifax to Trepassy Bay, the start for the Azores, and the remarkable adventures of the *NC-3*, "a small craft on a large ocean," in which circumstances not expected to happen demonstrated how very well the "boats" were designed and built and handled.

This book deals with an historical and epoch-making event. The "Triumph of the *NC's*" was indeed a triumph; a triumph of conception, a triumph of construction and a triumph of accomplishment. It is an inspiring story.

E. J. K.

"Derelicts." By James Sprunt. 285 pages. (Baltimore: Published by The Lord Baltimore Press.)

A collection of readable and interesting articles, of whose scope and character the best idea is to be gained from a consideration of the titles of the articles, which combine into three general groups:

(a) Marine Wanderers; Lost Liners; To the Rescue: an instructive account of ships lost at sea in general commercial traffic.

(b) Derelict Blockade Runners; a brief and interesting history of blockade runners stranded along the North Carolina coast in the years 1861-1865.

(c) Tales of the Sea: A Confederate Daughter; Intelligent Contrabands; Malingerers; Experiences in Quarantine; Confederate States Signal Corps; Captain John Newland Maffitt; Captain Maffitt and the Consul; Captain John Wilkinson; A Normal Blockading Experience; Captain Joseph Foy;

Recapture of the *Emily St. Pierre;* The *Lilian's* Last Successful Run: a collection of stories relating to the men and the ships who were engaged in running the blockade and the incidents that men and ships and danger always combine to create.

The fact that the author can say of most of his stories, "All of which I saw and a part of which I was" contributes in no small degree to the attractiveness of the accounts.

E. J. K.